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A CLINICAL AND PATHOLOGICAL STUDY OF PLACENTA ACCRETA

BY

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PATHOLOGICAL adherence of the placenta, or placenta accreta, is now a well recognized although rare complication of pregnancy. Recent personal experience with an unusual case of placenta-accreta-praevia-membranacea prompted a further investigation into the clinical and histological features of the pathologically adherent placenta. A total of 14 cases have been studied. Twelve of these occurred in the Royal Maternity Hospital, Glasgow, between 1934 and 1953. The other 2 cases occurred in Motherwell Maternity Hospital and Lennox Castle Maternity Hospital respectively, the pathological material being sent to the laboratory of the Royal Maternity Hospital, Glasgow, for examination.

INCIDENCE

There is a wide variation in the quoted incidence of placenta accreta. Dyer, Miller and McLaurin (1954) found 18 cases in 144,590 deliveries, an incidence of 1 in 8,032. Putterman and Detrano (1953) found only 2 cases in 31,390 deliveries, an incidence of 1 in 15,500. On the other hand, Irving and Hertig (1937), in a review of 20 cases, quoted an incidence of 1 in 1,956 deliveries, and Stone, Donnenfeld and Tanz (1954) found the incidence to be 1 in 2,000 at two New York hospitals, although only a 4-year period was reviewed. Burke (1951), in a review of 93,000 births, encountered 3 cases, an incidence of 1 in 31,000 pregnancies.

In the 20-year period 1934–1953 at the Royal Maternity Hospital, Glasgow, placenta accreta was found 12 times in 63,978 deliveries, an incidence of 1 in 5,332. However, 4 of these cases were emergency admissions on account of retained placenta and, if booked cases only are considered, the incidence falls to 1 in 8,000. It is likely that the actual incidence is more frequent than this. Many minor instances of partial placenta accreta are probably missed, and every obstetrician must have encountered some cases where the removal of the placenta could only be completed by separating small adherent pieces with the finger and thumb. Also, in the earlier years, many patients died from haemorrhage and sepsis with the placenta still retained, and in whom autopsy or histological examination was not made.

In the same 20-year period manual removal of the placenta was necessary in 1,245 patients (2 per cent); therefore one might expect to encounter a placenta accreta approximately once in every hundred manual removals attempted. However, in 3 of the 12 cases at the Royal Maternity Hospital, the condition was discovered during Caesarean section; 2 cases were admitted moribund with acute puerperal inversion of the uterus; therefore only 7 cases remain in whom the placenta accreta was discovered on attempted manual removal. The likelihood of encountering the condition thus drops to about once in every 178 manual removals attempted. Williams (1952) reviewed 188 cases where manual removal of the placenta was necessary but did not encounter any cases of placenta accreta. However, in the same period, 2 cases were noted at Caesarean section.

Aetiology

The constant pathological feature in all reported cases is absence or very poor development of the decidua. Any factor that may adversely affect the development of the decidua could result in placenta accreta.

Many causes have been listed but by no means substantiated. Previous endometrial trauma and infection have been incriminated most frequently although not constantly present.

In the present series, the possible predisposing causes are summarized in Table I.

Table I

Case No.	Age	Pregnancy	Maturity (Weeks)	Previous History	Site of Placenta	Other Placental Abnormality
1 ..	38	12th	38	8 normal pregnancies. 1 manual removal (with 11th). 2 complete abortions at 24 weeks.	Upper segment	—
2 ..	25	3rd	40	1 forceps delivery. 1 abortion at 6 weeks (curettage).	Upper segment	—
3 ..	24	2nd	40	1 forceps delivery with manual removal of the placenta.	Upper segment	—
4 ..	35	2nd	40	1 normal pregnancy.	Upper segment	—
5 ..	21	3rd	40	1 normal pregnancy.	Upper segment	—
6 ..	26	1st	41	No operations or pregnancies.	Upper segment	—
7 ..	42	1st	39	Dilatation and curettage for infertility 13 years previously.	Praevia	Membranacea
8 ..	30	8th	24	7 normal pregnancies. No operations.	Praevia	—
9 ..	30	3rd	40	1 forceps delivery with puerperal pyelitis. 1 twin pregnancy.	Upper segment	—
10 ..	28	1st	40	No operations or pregnancies.	Upper segment	—
11 ..	22	3rd	39	1 normal pregnancy. 1 pregnancy with manual removal of placenta.	Upper segment	—
12 ..	38	5th	36	3 normal pregnancies. Manual removal of placenta with 4th.	Upper segment	Membranacea
13 ..	38	5th	40	1 forceps delivery. 1 manual removal of placenta. 1 missed abortion (curettage). 1 lower uterine segment Caesarean section.	Upper segment	—
14 ..	42	5th	37	3 abortions all requiring curettage. 1 lower uterine segment Caesarean section.	Praevia	Membranacea

(a) *Age and Parity*

Placenta accreta can be found at any age in the reproductive period of life. High parity does not appear to have any significance as 3 cases occurred in primigravidae and 6 occurred in a 2nd or 3rd pregnancy.

(b) *Previous Endometrial Trauma and Infection*

A study of the previous histories in the 14 cases does not lend support to the general view that previous endometrial trauma and infection play a significant part in the aetiology. Two primigravidae had had no previous operations or illnesses, 1 primigravida had dilatation and curettage performed for infertility 13 years previously. Only 3 of the parous patients had required previous curettage for abortions and if curettage was of any significance one would expect a very high incidence of placenta accreta considering the many thousands of operations of this type performed annually. It is more likely that a curettage in a previous pregnancy was necessary on account of partial adherence of the products of conception, possibly due to decidual deficiency.

In only 1 case could a history of previous infection be confirmed and this proved to be puerperal pyelitis. Infection can be ruled out as a cause of defective decidua in the present series.

With regard to previous Caesarean sections, 2 patients had the lower segment operation performed in the previous pregnancy. In one the placenta accreta occurred in the upper segment well away from the site of the scar, but in the other the placental attachment was widespread in the lower segment, including the site of the scar, and extended into the upper segment being of the membranacea-praevia type.

In the 9 cases reported by Kistner, Hertig and Reid (1952) 5 had had previous Caesarean sections and in all cases areas other than the scar region were the site of the placenta accreta. It is unlikely that previous Caesarean section is of any significance: I can remember several cases where the placenta has been found at repeat section or during manual removal to be implanted over a classical operation scar and where there was no difficulty in separation and removal.

(c) *Previous Manual Removal of the Placenta*

The high incidence of previous manual removal of the placenta in these cases is very striking. Five of the 14 cases had had this operation (35 per cent).

The incidence of previous manual removal in the 18 cases reported by Dyer, Miller and McLaurin (1954) was 22 per cent. It might be assumed that the previous manual removals were responsible for a low grade endometrial infection which led to abnormal attachment of the placenta in a subsequent pregnancy, but it appears equally likely that the retention of the placenta in a previous pregnancy was also due to decidual deficiency, although of less severity than that subsequently associated with a placenta accreta.

In the case reported by James and Misch (1955), the previous pregnancy had been complicated by a secondary post-partum haemorrhage. Exploration of the uterus revealed some pieces of very adherent placenta and this was probably a lesser degree of placenta accreta, although exploration may have introduced infection. In any case of established infection of the endometrium from whatever cause it is very unlikely that pregnancy would occur at all because of the interference with conception and imbedding that the infection would give rise to.

It is widely accepted that there is a tendency for some patients to retain the placenta habitually and for manual removals to become increasingly difficult in subsequent pregnancies. This difficulty is almost certainly due to the presence of small areas of placenta accreta and the maternal surface of the placenta in these cases usually shows scattered ragged areas where small quantities of placental tissue are missing.

In a subsequent pregnancy when the pathological adherence of the placenta may become a little more widespread, but not complete, a partial manual removal may be attempted before the true state of affairs is discovered. In 13 of the cases reported by Dyer and colleagues (1954), incomplete manual removal of the placenta was followed by persistent bleeding in 10 cases which required treatment by hysterectomy. The presence of a partial placenta accreta was then confirmed.

(d) *Time of Development of Placenta Accreta*

In the present series, the earliest period of gestation when the abnormality was diagnosed was 24 weeks.

Irving and Hertig (1937) found 2 cases at 16 weeks. Epperson, Luzadre and Lacy (1955), in their series of 6 cases, described 1 case of confirmed placenta accreta at the 12th week of pregnancy in a patient who had persistent bleeding after an abortion. Hysterectomy was performed 8 weeks later on account of this bleeding and associated uterine fibroids. Dyer *et al.* (1954) describe a most interesting case at the 10th week. Dilatation and curettage on two occasions after an incomplete abortion failed to control haemorrhage and subtotal hysterectomy was necessary.

These last two reports are highly significant and indicate that placenta accreta does not develop in the later months as a result of secondary disappearance or absorption of the decidua but that it is present before the definitive placenta has completely formed, probably as a result of a primary decidual deficiency.

There are probably many more undiagnosed instances of partial placenta accreta in patients with early incomplete abortions, particularly those where the removal of chorionic remnants with ovum forceps proves difficult on account of undue adherency. In some cases of missed abortion, the retention of the products for many months might conceivably be due to placenta accreta as it is in such cases that the abnormal adherence of the products may make evacuation of the uterus exceptionally difficult and haemorrhagic.

(e) *Association with Placenta Praevia*

In most reported cases of placenta accreta there is a high incidence of implantation of part or all of the placenta in the lower segment. The incidence of placenta praevia in the present series is 21·4 per cent, a striking increase compared with the average incidence for placenta praevia of 3 per cent of all deliveries at the Royal Maternity Hospital.

Irving and Hertig (1937) reviewed 86 cases of placenta accreta from reports in the literature and found 13 cases with associated placenta praevia, an incidence of 15 per cent. Many more reports of placenta praevia-accreta have appeared since then. Stone *et al.* (1954) found 2 examples in 4 cases, Kistner *et al.* (1952) reported 9 cases, all placenta praevia-accreta. Single cases are reported by Wilens (1942), Shotton and Taylor (1944), Gemmell (1947), Chisholm (1948), Callender and King (1949), Chern and Rosenberg (1955) and James and Misch (1955). The placenta has been situated in the lower uterine segment approximately 40 times in over 200 reported cases of placenta accreta, an approximate incidence of 20 per cent.

Normally, decidual formation in the lower uterine segment is generally regarded as being much poorer than in the upper segment. Where some degree of decidual deficiency generally existed, it is reasonable to assume that there would be even greater deficiency in the lower segment which might predispose to abnormal adherence of the placenta. In cases of placenta accreta, the very high incidence of implantation in the lower uterine segment lends support to the theory that a primary decidual deficiency is the underlying cause. Dyer and his colleagues (1954) described 2 highly significant cases of placenta praevia-accreta. In both, the placenta accreta was partial and occurred *only in those parts of the placentas lying in the lower uterine segment*. A similar case has very recently been encountered by the writer and will be reported later.

(f) *Association with Placenta Membranacea*

Placenta membranacea is a very rare abnormality of pregnancy and it is of great interest that it should occur so frequently in association with placenta accreta—it was found in 3 of the 14 cases (21·4 per cent) in the present series, in 6 of the 86 cases reviewed by Irving and Hertig (1937) and in the case reported by James and Misch (1955).

It is suggested by Beck (1951) that placenta membranacea is due to a defective decidua basalis with poor vascular supply to the villi in the area of the chorion frondosum. As a result the villi of the chorion laeve do not atrophy but remain permanent in an attempt to compensate for the inadequate vascularity. If this is so, then the conditions are also present

which might theoretically result in placenta accreta. The frequent association of the two abnormalities does in fact indicate that this happens and that placenta accreta is also a result of decidual deficiency.

Histology

Fresh histological preparations have been made in all cases. To aid the identification of doubtful tissue layers the following different histological stains were used: Haematoxylin and Eosin, Masson's trichrome, Mallory's trichrome, Van Gieson's, Periodic acid oxidation-Schiff, and Phosphotungstic acid-Haematoxylin (P.T.A.H.).

(a) *Normal Utero-placental Junction*

Sections from normal cases in the last few weeks of pregnancy have been studied for comparison with the pathologically adherent placenta. In a typical case there is a layer of decidua of variable thickness on the surface of the uterine muscle. Compact and spongy decidua can be recognized and there are numerous decidual sinusoids (Fig. 1). In some areas the decidua is very thin but in others it is thick and appears pulled up into the placental septa. Villi are seen to have penetrated into the decidua, both directly and *via* the decidual sinusoids. The majority of those penetrating directly show varying degrees of degeneration due to fibrin deposition completely encircling them, but those in the decidual sinusoids are largely unaffected by fibrin deposition.

The uterine muscle shows hypertrophy, increased vascularity and some looseness of muscle bundles.

Very few villi are directly attached to the decidua. The majority are seen to be separated from it in most cases by a thin layer of fibrin (Figs. 2 and 3). The chorionic plate or trophoblastic shell on the surface of the decidua is very scanty and composed mainly of the fibroblastic tissue similar to the villus core with a thin interrupted covering of syncytiotrophoblast (Fig. 3). Large areas show no evidence of the chorionic plate (Figs. 1 and 2) although in earlier stages of pregnancy it is a more defined layer. In some areas the chorionic plate is separated from the decidua by a layer of fibrin—Nitabuch's fibrin stria (Fig. 3). A few thick stems of villus fibroblastic tissue covered by a thin layer of syncytiotrophoblast are seen extending through bunches of villi to reach the decidua where the fibroblastic tissue spreads over the decidual surface in all directions for a short distance. These probably represent the true anchoring villi and form most of the chorionic plate by spread of the fibroblastic core (Fig. 4). The villi show a single layer of syncytium, vary in size, and the villus core is largely occupied by thin-walled capillaries and a loose fibroblastic network. Intervillous fibrin deposition is very variable in amount. In the many sections examined, some fibrin deposition was always present, varying from very small deposits on individual villi to massive areas engulfing large numbers of villi which had undergone ischaemic necrosis as a result of the fibrin deposition. The most marked fibrin deposition in the majority of cases was on the surface of the decidua forming a complete and usually continuous layer separating it from the villi (Fig. 2). This is usually regarded as a fusion of Rohr's and Nitabuch's fibrin striae. Some of the fibrin from this layer is seen extending among the villi to form the large areas of ischaemic necrosis of villi; but other large areas of ischaemic necrosis of villi from fibrin deposition are found well away from the decidual surface. In some specimens little or no fibrin deposition was seen between the decidua and villi. In others, fibrin was present between the decidua and villi, but not between the chorionic plate and villi. From this it might be assumed that, where the chorionic plate was absent, fibrin was deposited on the surface of the decidua, but a more detailed examination of further specimens showed that fibrin deposition between the chorionic plate and villi did occur (Fig. 3).

Detailed examination of the individual small fibrin deposits on separate villi usually showed that they occurred in areas where the syncytial covering was absent and the appearances suggested that the villus had ruptured (Fig. 1).

Fibrin deposition within the decidua was frequently noted, irregular in distribution and often forming 2 or 3 strata (Fig. 2).

In previous descriptions of the utero-placental

junction the accepted layers taken in order are as follows: uterine muscle, decidua, Nitabuch's fibrin striae between decidua and chorionic plate, chorionic plate or trophoblastic shell, Rohr's fibrin striae between chorionic plate and villi, and lastly villi.

After 34 weeks the chorionic plate disappears in parts and Nitabuch's and Rohr's fibrin striae merge together forming one layer between decidua and villi.

The findings in the present study largely agree with these accepted views, but the fibrin deposition is so variable in amount and distribution that it is difficult to say whether Nitabuch's layer or Rohr's layer persists. One or the other may appear to predominate in different sections. Probably both layers persist and merge together in an irregular manner depending on the degree of atrophy or infiltration in the intervening chorionic plate. A noticeable feature not previously described is the intra-decidual fibrin deposition, also merging with the other layers in an irregular manner.

(b) *Histology of Placenta Accreta*

(1) *General Findings.* Placenta accreta has been divided further into placenta increta where the villi have penetrated for a variable distance into the uterine muscle, and placenta percreta where the villi have perforated the uterine wall. The pathological adhesion may be partial or complete irrespective of the degree of penetration of the uterine muscle. In the 14 cases studied, 6 were partial and 8 complete. Three of the partial cases were accreta and 3 were of the increta variety. Four of the complete cases were accreta, 3 were increta and 1 was a placenta percreta.

Microscopically, the predominant feature in most cases was the absence of the decidua (Fig. 5). However, in 2 cases a few small isolated clumps of decidual cells could be recognized usually enmeshed in fibrin deposition. In sections of the uterine wall away from the placental site there was either no decidua at all or only a thin interrupted layer. Villi were either directly attached to muscle, or separated by a well-defined layer of fibrin (Fig. 6). So many minor variations were noted that the other structures are considered separately.

(2) *Villi.* The villi did not show any changes which might suggest that their invasiveness was greater than normal. Syncytium, fibroblastic stroma and villus capillaries were no different from those in normal placentas and fibrin deposition followed the usual normal variations.

(3) *Chorionic Plate.* There was no evidence of a chorionic plate in most sections. In a few areas it could be recognized as thin interrupted patches between the villi and the muscle mainly consisting of villus fibroblastic tissue (Figs. 7 and 8). Fibrin deposition on both sides of the chorionic plate was usually noted (Fig. 8), associated with varying degrees of hyalinization of the plate. The appearances did not suggest that an excessive chorionic plate formation was responsible for the placental adherence.

(4) *Uterine Muscle.* Increased vascularity of the superficial layers was a prominent feature in most cases. Chorionic villi were seen inside some of the myometrial sinusoids (Fig. 7). The muscle cells were of normal appearance and as in the normal case some syncytiotrophoblast cells were seen to have penetrated the muscle substance. Muscle was seen forming placental septa indicating the penetration of the muscle by the villi (Fig. 9). There was some hyalinization of the superficial layers of the muscle in a few cases (Fig. 14) and hyaline changes were seen in an inconstant layer between the fibrin layer and the muscle (Fig. 10) or between the villi and muscle where fibrin was absent. This layer contained patches of degenerate chorionic plate and groups of larger cells which were of doubtful origin. They may have been decidual cells but it is also likely that some were muscle cells undergoing changes as a result of the digestive action of the trophoblastic enzymes. In the sections of placenta percreta the hyalinization of muscle was the most marked of all (Fig. 11). It was easy to mistake fibrin deposition for hyalinization unless sections stained with phosphotungstic acid–haematoxylin were examined for comparison.

(5) *Uterine Blood Vessels.* The vessels were dilated and thin-walled in the superficial muscle layers and greatly increased in numbers. No endarteritis or thrombosis was seen. There was no evidence that a defective blood supply might have caused atrophy or deficiency of the decidua.

FIG. 1

Chorio-decidual junction in a normal case. Thick layer of decidua and large decidual sinusoids. Villi attached to decidua by fibroblastic core. No chorionic plate. Some intervillous fibrin deposition giving impression that it has occurred at sites of rupture of the villi. A little fibrin is seen between villi and decidua. H. & E. ×105.

FIG. 2

Normal case. Very marked intra-decidual fibrin deposition isolating islets of decidual cells. More dense fibrin layer between villi and the decidua. H. & E. ×105.

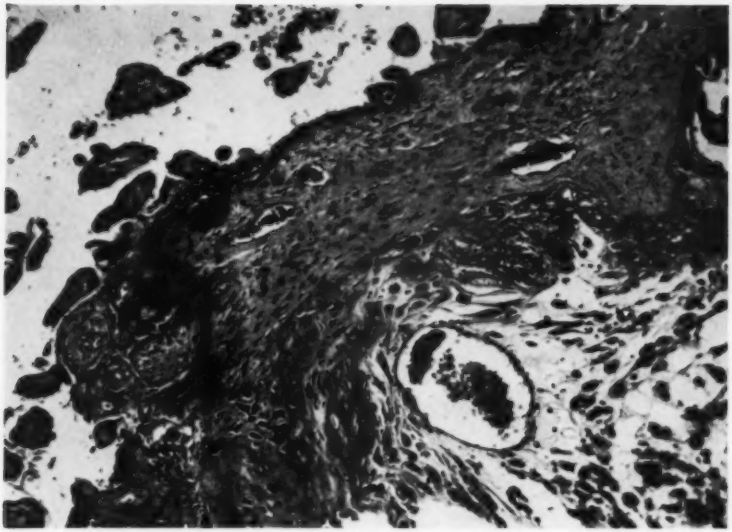

FIG. 3

Normal case. More defined chorionic plate. Loose decidua. Fibrin deposition is well seen between decidua and chorionic plate (Nitabuch's stria), and there is a thin, dense layer of fibrin between the chorionic plate and villi (Rohr's stria). H. & E. ×105.

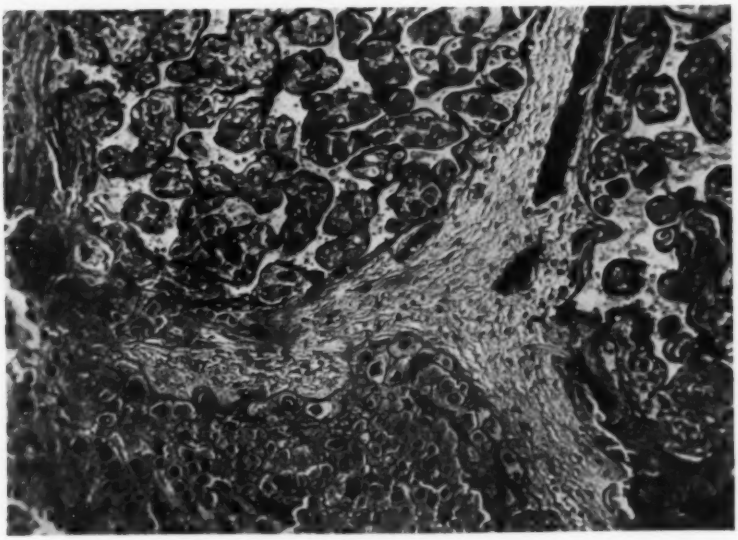

FIG. 4

Normal case. Good example of a stem or anchoring villus with the fibroblastic core spreading over the decidua. Very scanty fibrin deposition. The decidual cells are clearly defined. H. & E. ×105.

W.G.M.

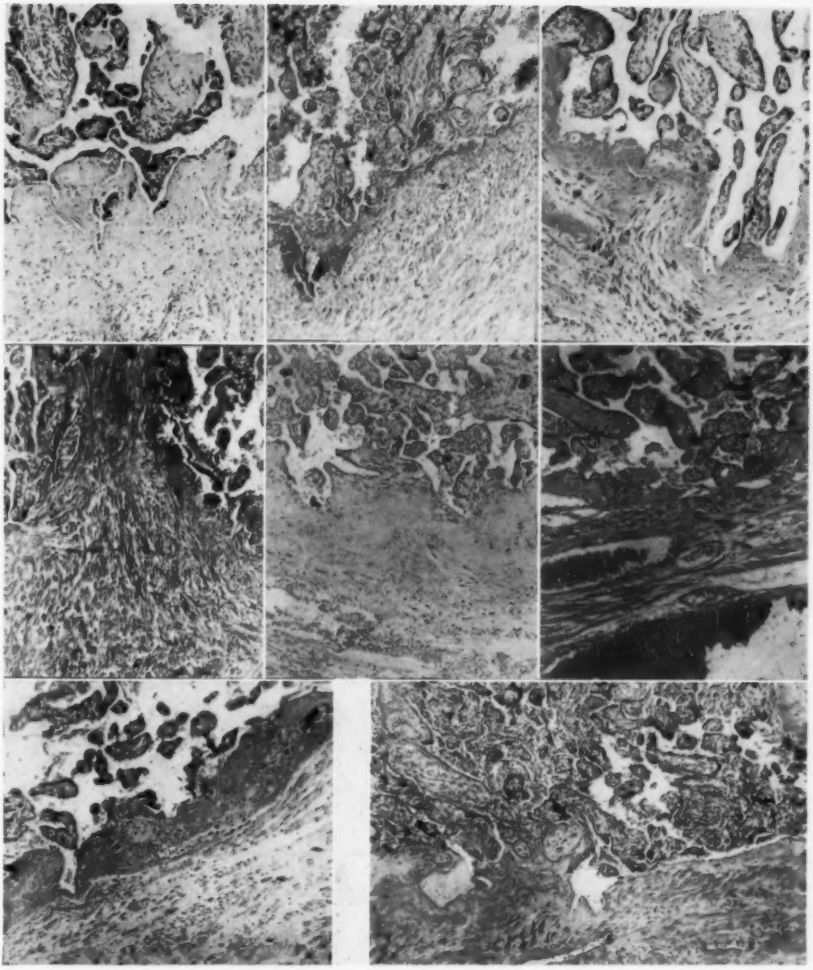

FIG. 5

Placenta accreta. Typical examples of 8 different cases to show absence of decidua. Villi directly attached to muscle with varying degree of muscle penetration. H. & E. ×70.

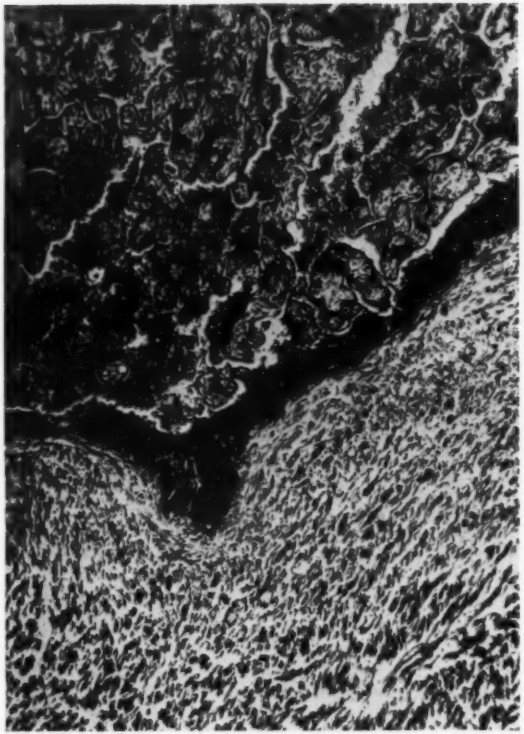

FIG. 6

Placenta accreta. Case 9. No decidua. No hyalinization of muscle. Dense fibrin layer between villi and muscle. Some intervillus fibrin deposition. P.T.A.H. ×105.

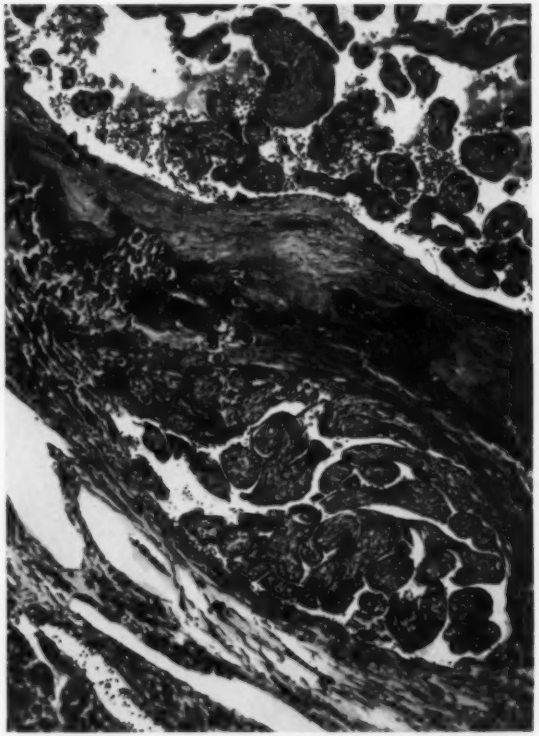

FIG. 7

Placenta accreta. Case 11. No decidua. Chorionic plate present. No fibrin between chorionic plate and villi. Well-defined thin layer of fibrin between chorionic plate and muscle (Nitabuch's layer). Vascular myometrium. Villi are seen inside large myometrial sinusoid. H. & E. ×105.

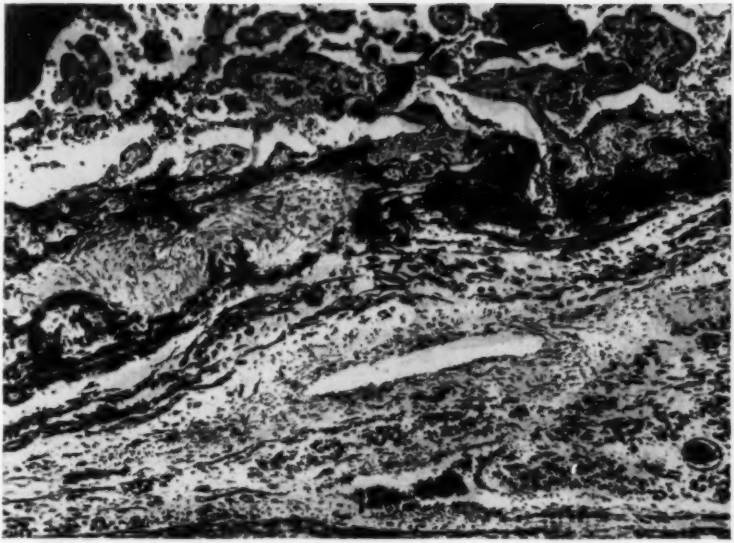

FIG. 8

Placenta accreta. Case 7. No decidua. Chorionic plate of variable thickness with fibrin deposition on both sides of the plate (Rohr's and Nitabuch's striae). Loose muscle arrangement. P.T.A.H. ×105.

FIG. 9

Placenta accreta. Placental septum of myometrium indicating the deep penetration of the muscle by the villi. No decidua, fibrin, or chorionic plate. Case 5. P.T.A.H. ×105.

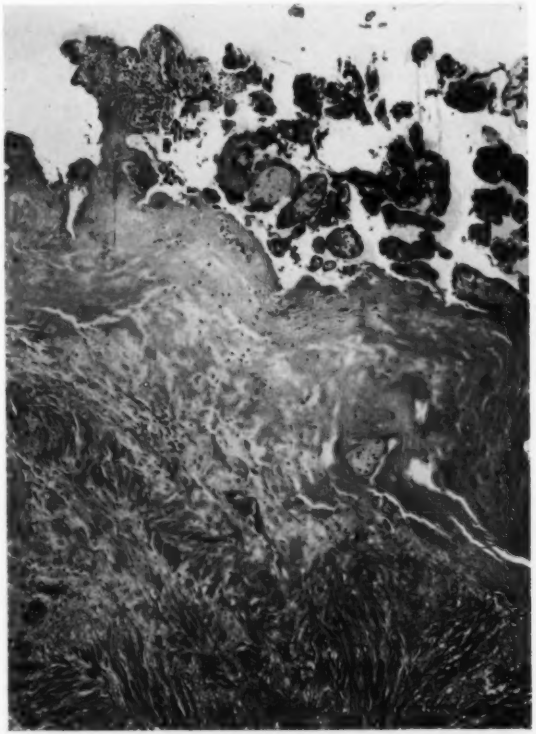

FIG. 10

Placenta accreta. Case 13. Hyalinization of superficial layers of the muscle and layer of fibrin between the villi and the hyalinized muscle layer. No decidua or chorionic plate. H. & E. ×105.

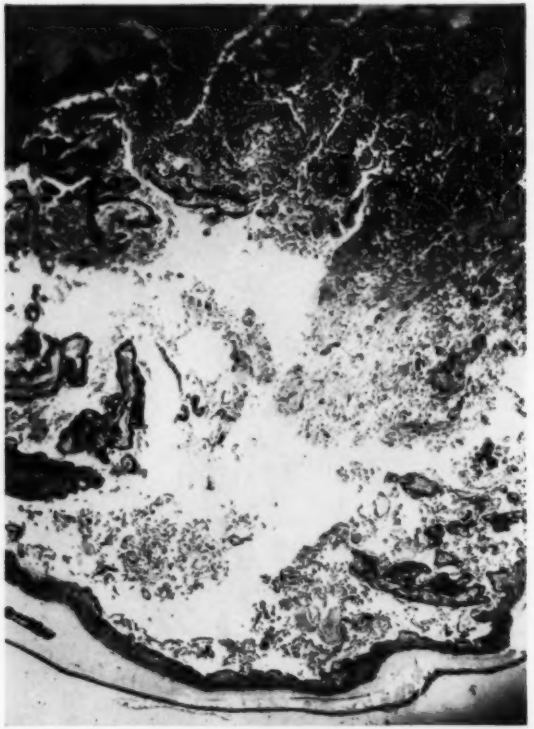

FIG. 11

Placenta accreta, percreta variety. Section taken near site of perforation of the uterus by the villi. Section shows the excessive thinning of the uterine wall. Case 12. P.T.A.H. ×5·5.

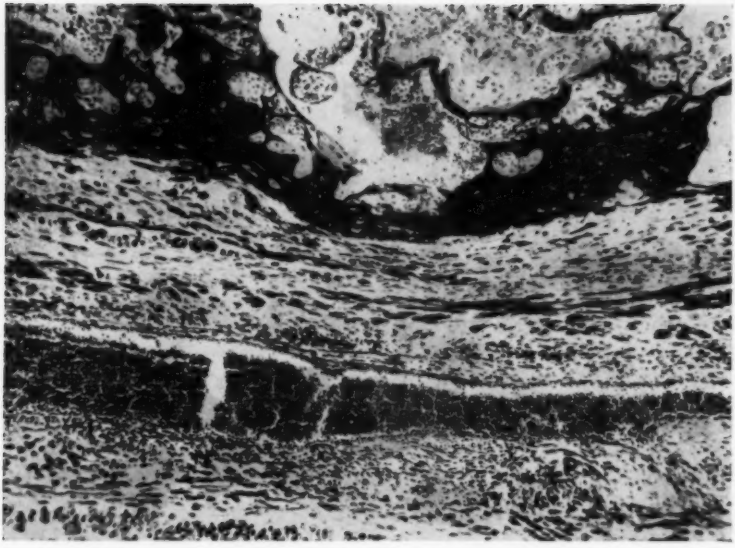

FIG. 12

Placenta accreta, Case 2. No decidua or chorionic plate. Dense fibrin layer between villi and muscle (Rohr's stria), and the fibrin is seen to be spreading among the villi causing ischaemic necrosis. Large myometrial sinusoid is seen. P.T.A.H. ×105.

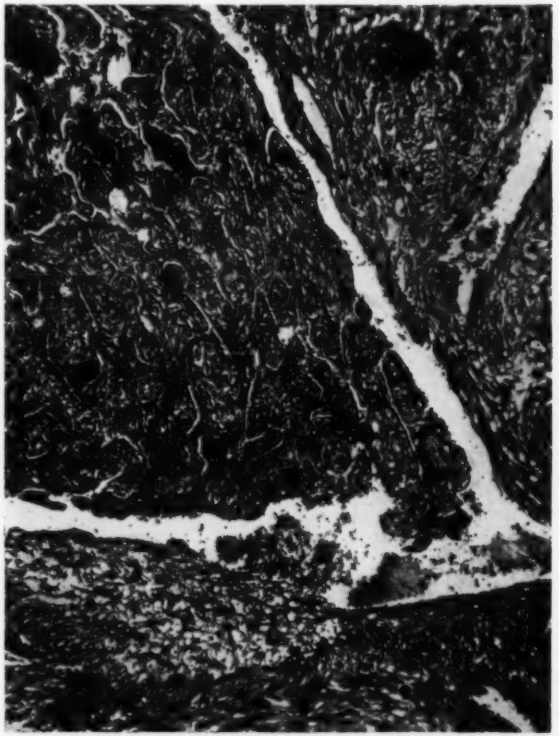

FIG. 13

Placenta accreta. Case 9. Deep penetration of the muscle by the villi. No decidua or chorionic plate. A little intervillus fibrin but none between villi and muscle. P.T.A.H. ×105.

FIG. 14

Placenta accreta. No decidua or chorionic plate. Some hyalinization of muscle. Dense, thin layer of fibrin between villi and muscle. Case 8. P.T.A.H. ×105.

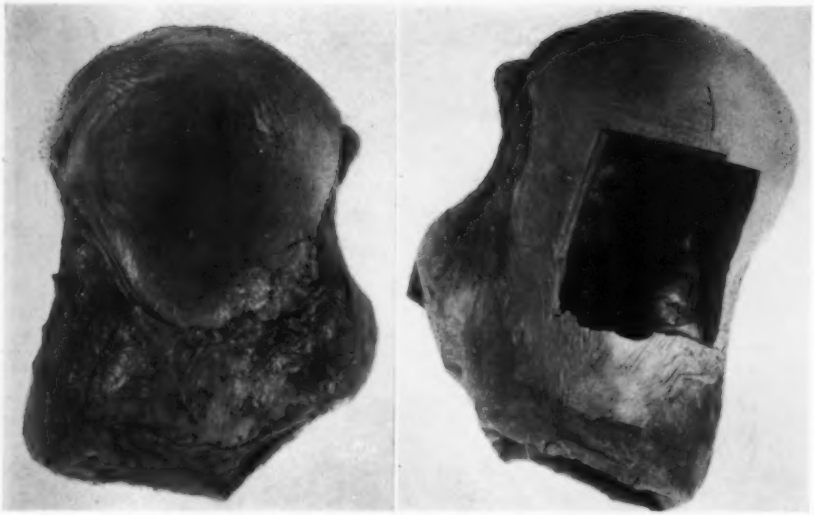

FIG. 15

Anterior and posterior view of the excised uterus in Case 14. Part of the posterior uterine wall has been cut away to show the placenta still attached. Only the right side of the uterus and part of the posterior wall were not covered by the placenta membranacea-praevia-accreta. The bulge on the left side of the uterus is an incomplete rupture of the previous lower segment operation scar. The incision in the lower segment is closed with string in the specimen.

(6) *Fibrin Deposition.* There were many variations in the amount and distribution of the fibrin. Some sections showed only a few isolated areas of fibrin deposition on individual villi with no fibrin deposition between the villi and the uterine muscle (Figs. 5 and 13). In others, there was a dense layer of fibrin between the villi and the muscle (Figs. 6 and 14) with small patches of thin chorionic plate between some of the fibrin (Fig. 8). Both Rohr's and Nitabuch's fibrin striae could be recognized in some sections (Fig. 8), one or the other predominating. It is generally stated that Nitabuch's layer is absent in placenta accreta because of the absent decidua as the formation of this layer is believed to be a function of the decidua. This is not borne out by the present study as Nitabuch's layer beneath the chorionic plate can be seen in some sections (Figs. 7 and 8). Some fibrin in the site of Rohr's striae could be seen extending into and enmeshing bunches of villi causing ischaemic necrosis (Fig. 12) but, as in the normal placentas, ischaemic necrosis of villi from fibrin deposition was also seen in areas well away from the maternal surface of the placenta. The adherence of the placenta is not due to excessive fibrin deposition and the variations described are similar to those seen in normal placentas. No extension of fibrin deposition into the uterine muscle was noted.

(7) *Conclusions.* The only constant feature in placenta accreta is the complete or almost complete absence of the decidua. The variations in chorionic plate and fibrin distribution are in keeping with those seen in the normal placentas. Hyalinization of small patches of chorionic plate and of clumps of decidua-like cells or altered muscle cells is frequently present. The myometrium shows increased vascularity in the superficial layers, and a variable degree of superficial hyalinization. It forms some of the placental septa. There was little or no decidual layer on the muscle in areas away from the placental site.

Clinical Course and Treatment

No significant feature occurred during the antenatal period to suggest the presence of a placenta accreta. The progress of labour was not affected. There were 6 spontaneous vaginal deliveries, 2 breech deliveries, 1 forceps delivery and 5 Caesarean sections (3 elective). All babies were born alive with the exception of the breech delivery at the 24th week of pregnancy. Details of each case are summarized in Table II. The clinical features, management and prognosis subsequently depended very much on whether the placenta accreta was discovered after vaginal delivery or during Caesarean section, and the 2 groups are considered separately.

(a) *Following Vaginal Delivery*

Spontaneous post-partum haemorrhage occurred in 6 of the 9 patients delivered vaginally (66·7 per cent) and it is significant that the extent of the placental adherence in these cases was partial. In the remaining 3 patients delivered vaginally the placenta accreta was complete and no post-partum haemorrhage occurred. Attempted manual removal of the placenta (twice) in one of these patients caused brisk bleeding necessitating hysterectomy. The other 2 patients unfortunately developed the grave complication of acute inversion of the uterus and were admitted to hospital in a moribund state.

In Irving and Hertig's (1937) series of 18 cases (all delivered vaginally) the incidence of spontaneous post-partum haemorrhage was also 66·7 per cent, and Dyer *et al.* (1954) in their 18 cases noted spontaneous post-partum haemorrhage in 10 of the 15 vaginal deliveries (66·7 per cent).

A summary of the management in each patient is given in Table II. Expression of the placenta was attempted unsuccessfully in 4 patients with resultant bleeding and all died before anything else could be done. In 2 patients manual removal was attempted without success. One of these patients died from haemorrhage a few hours later. The other patient was subjected to a further unsuccessful attempt at removal of the placenta 2 days later, but continued bleeding necessitated hysterectomy on the 5th day and death occurred from severe puerperal sepsis. Two patients were admitted to hospital with acute inversion of the uterus; one was dead on arrival and the other died very shortly after admission. One patient who had a severe post-

TABLE II

Case No.	Delivery	3rd Stage	Extent of Adherence	Management
1 ..	Spontaneous alive	Brisk P.P.H. half an hour after delivery	Partial Accreta	Attempted expression. Transfusion. Died 2 hours after delivery.
2 ..	L.S.C.S. alive	No line of cleavage between uterus and placenta	Complete Increta	Placenta stripped off with gauze. Uncontrollable haemorrhage. Died.
3 ..	Spontaneous alive	No bleeding. Failure of placenta to separate	Complete Increta	Attempted manual removal (twice). P.P.H. Hysterectomy. Died.
4 ..	Spontaneous alive	Complete inversion of uterus	Complete Accreta	Admitted dead 1½ hours after delivery.
5 ..	Spontaneous alive	Brisk P.P.H. No attendant at delivery	Partial Increta	Admitted 2½ hours after delivery. Very shocked. Attempted expression. Died.
6 ..	Forceps alive	Placenta could not be expressed. P.P.H.	Partial Accreta	Continued bleeding. Incomplete manual removal. Died 6 hours later.
7 ..	C.C.S. alive	Placenta praevia. No line of cleavage	Complete Increta	Placenta torn off piecemeal. Uncontrollable haemorrhage. Transfusion. Died.
8 ..	Breech S.B.	Placenta praevia. Leg traction. Placenta retained	Partial Accreta	Died 18 hours after delivery from septicaemia and haemorrhage. Placenta still *in situ*.
9 ..	Breech alive	Brisk P.P.H. half an hour after delivery	Partial Increta	Placenta expressed. Incomplete. Continued haemorrhage. Died.
10 ..	Spontaneous alive	Complete inversion of uterus	Complete Accreta	Died before any treatment could be given.
11 ..	Spontaneous alive	Brisk P.P.H. 1½ hours later.	Partial Increta	Admitted dead 4 hours after delivery.
12 ..	C.C.S. alive	Ante-partum rupture of uterus by perforating villi	Complete Percreta	Caesarean hysterectomy. Recovered.
13 ..	C.C.S. alive	No line of cleavage found	Complete Accreta	Attempted stripping. Severe bleeding. Hysterectomy. Recovered.
14 ..	L.S.C.S. alive	No line of cleavage found. Placenta praevia	Complete Accreta	Attempted stripping. Severe bleeding. Placenta membranacea. Hysterectomy. Recovered.

L.S.C.S.: Lower segment Caesarean section.
C.C.S.: Classical Caesarean section.
P.P.H.: Post-partum haemorrhage.

partum haemorrhage was dead on arrival at the hospital.

(b) *During Caesarean Section*

Placenta accreta was discovered in 5 cases during Caesarean section. In 2 cases, the placenta was forcibly stripped off in pieces. Uncontrollable haemorrhage resulted and both patients died. In the remaining 3 cases subtotal hysterectomy was immediately proceeded with and all the patients made a good recovery.

The mortality rate in the present series following vaginal delivery is appalling, all mothers being lost, but these cases were treated over 15 years ago when antibiotics were not available and transfusion facilities not so perfect as nowadays. Post-partum hysterectomy was also a more hazardous operation under these

conditions and would not have been undertaken readily. No doubt if the operation had been performed immediately some mothers would have been saved.

Following discovery during Caesarean section, immediate hysterectomy saved all the mothers so treated.

Irving and Hertig (1937) reported a mortality rate of 5·5 per cent in their 18 cases. Hysterectomy was performed in 15 of these cases with no deaths. In the 86 cases which they reviewed from the published literature, the mortality rate for incomplete manual removal followed by hysterectomy was 56·4 per cent, but all patients survived who were treated by hysterectomy immediately the diagnosis was made. Manual removal alone gave the high mortality rate of 64·5 per cent, and 2 of 3 cases where the placenta was left *in situ* subsequently died, a mortality rate of 66·7 per cent. The overall mortality rate for the cases reviewed in the literature was 37·2 per cent. Dyer *et al.* (1954) had 2 deaths in their 18 cases. Hysterectomy was the treatment in 14 cases; one of these patients died, a mortality rate for hysterectomy of 7·1 per cent. The other 4 cases were treated by partial manual removal of the placenta with a mortality rate of 25 per cent.

Immediate hysterectomy obviously gives the best results and the earlier it is done the lower the mortality. However, Kaltreider (1945) quotes 7 cases where the placenta was left *in situ* and all patients recovered, and Schumann (1940) describes 4 cases similarly treated successfully, 2 of the patients subsequently having further normal pregnancy. These are exceptional cases and the circumstances which might justify conservative treatment are as follows:

(*a*) Complete or almost complete placenta accreta;
(*b*) No spontaneous post-partum haemorrhage;
(*c*) Recognition of the condition before too vigorous attempts had been made to remove the placenta;
(*d*) Scanty or no bleeding following attempts to separate the placenta.

Should such treatment be adopted, everything must be in readiness for immediate hysterectomy in the event of secondary post-partum haemorrhage.

Complications

(a) *Inversion of the Uterus*

This complication occurred in 2 patients (14·3 per cent) who died shortly afterwards. In a review of 73 cases of placenta accreta, Kaltreider (1945) found 3 cases complicated by inversion of the uterus (4·1 per cent). It is rather surprising that inversion of the uterus with placenta accreta has not been reported more frequently. The circumstances would theoretically predispose to inversion, particularly where the adherent placenta was implanted at the fundus. Das (1940) in a review of 391 cases of inversion of the uterus noted the high frequency of fundal implantation of the placenta but did not quote a single instance of placenta accreta. However, he regarded the pathologically adherent placenta as one of the causes of inversion. Bell, Wilson and Wilson (1953) reviewed a further 76 cases of inversion of the uterus and again there was no mention of placenta accreta in any case. One of the earliest recorded cases of placenta accreta complicated by inversion of the uterus is that described by Stone (1898). The patient was a primigravida and the placenta was found in the vagina firmly attached to the inverted uterus. It was torn off piecemeal with great difficulty following which the patient died from haemorrhage. Stone reviewed 24 cases of inversion and in 10 the placenta was said to be very adherent.

(b) *Spontaneous Rupture of the Uterus*

This interesting complication results from perforation of the uterus by the chorionic villi in the rare cases of placenta percreta. It occurred in 1 case in the present series, an incidence of 7·1 per cent. The clinical details of the patient are summarized in Tables I and II (Case No. 12). Signs of intra-peritoneal haemorrhage, shock and abdominal pain are the constant features. In Kaltreider's 73 cases spontaneous rupture of the uterus occurred 11 times, an incidence of 15·1 per cent. He also described 5 cases of rupture of the uterus during attempted manual removal of the placenta. Further single cases of placenta percreta causing rupture of the uterus have been reported by Burke (1951), Schuyler (1952) and Stone *et al.* (1954). Callender and

King (1949) report one case of spontaneous rupture of the upper segment with a Type IV placenta praevia-accreta. A previous difficult breech delivery and manual removal of the placenta were probably the cause of the subsequent rupture, with an incidental placenta accreta. The need for manual removal in the previous pregnancy might well have been due to a partial placenta accreta; damage to the uterine wall at the time of removal would explain the subsequent rupture. Pettit and Mitchell (1949) describe an unusual case of gross haemoperitoneum associated with placenta percreta but without obvious rupture of the uterine wall. The bleeding arose from rupture of grossly dilated subserosal veins. It is likely in this case that uterine rupture would have eventually resulted had not earlier warning been given by the haemoperitoneum.

Placenta Praevia-Membranacea-Accreta

Two examples of this extremely rare combination of abnormalities are included in the present series (Cases Nos. 7 and 14, Tables I and II). Case No. 14 was encountered by the writer and the excised uterus with an area of the posterior wall removed to show part of the placenta is illustrated in Figure 15. The placenta was attached over the whole lower segment and extended upwards anteriorly, round the left side of the uterus and over the fundus. Only a small area on the right side of the uterus and posterior wall was not occupied by placenta. The patient made a good recovery after subtotal hysterectomy and blood transfusion.

Only 1 other case of placenta praevia-membranacea-accreta can be found in the literature, reported by James and Misch (1955). As previously mentioned, both placenta praevia and placenta membranacea may predispose to the development of placenta accreta, and the two conditions together should increase the likelihood.

Discussion

Placenta accreta is undoubtedly rare, but, as Irving and Hertig point out, many more minor examples are probably not diagnosed. Quite often a placenta is described as "adherent" in operation notes and although the operator may in some instances mean "attached but not morbidly adherent", most obstetricians must have encountered some cases where part of the placenta could not be separated by the usual gentle manipulations. Small areas of placenta accreta probably cause this difficulty. One patient in the present series who died following manual removal of the placenta was found to have a small piece of placenta still firmly attached to the uterus which was confirmed to be a partial placenta accreta. Small pieces of placenta are often discovered during curettage for secondary post-partum haemorrhage and it is likely that they were retained because of a minor degree of placenta accreta.

Analysis of the previous histories has ruled out infection as a contributing cause, and histological examination of the uterus and placenta failed to show significant infection with the exception of one patient who died from fulminating septicaemia on the 6th day after delivery, hysterectomy having been done on the 5th day on account of secondary haemorrhage with the placenta still undelivered.

The presence of a scar in the uterus might theoretically favour abnormal implantation in that area, but this is not borne out by the rarity of focal placenta accreta following classical Caesarean section and the occurrence of the placenta accreta in areas other than the operation scar. Moreover, following Caesarean section or myomectomy the endometrium quickly covers the operation scar and restores the continuity of the uterine lining.

The high incidence of a previous manual removal of the placenta in these cases might incriminate trauma as a cause, but it is more likely that the previous manual removal was necessary on account of a lesser degree of morbid placental adherence. A significant number of patients have also required curettage in a previous pregnancy on account of secondary post-partum haemorrhage. If previous trauma and infection did influence the development of placenta accreta it would occur much more frequently than it does, considering the many thousands of manual removals and curettages done every year.

The absence or very scanty development of the decidua might be due to a primary decidual deficiency or to a secondary absorption of the decidua by excessive trophoblastic activity. A primary decidual deficiency is more likely for the following reasons:

(*a*) Histological examination shows no evidence of any abnormality or change in the appearance of the trophoblastic tissues compared with the normal.

(*b*) The presence of placenta accreta as early as the 10th week of pregnancy.

(*c*) The high incidence of placenta praevia in these cases, particularly those where the pathological adherence only affects the parts of the placenta occupying the lower segment, the decidua normally being thinner in that area.

(*d*) The relatively high incidence of placenta membranacea, an abnormality also believed to be due to a deficient decidua.

(*e*) The absent or scanty decidua in areas other than the placental site. This is a significant finding and rules out the possibility of absorption of the decidua by the placental villi.

The underlying cause of the primary decidual deficiency is likely to be hormonal. In the investigation of gynaecological complaints such as sterility, dysmenorrhoea, etc., curettage in the pre-menstrual phase of the cycle sometimes fails to produce any endometrium at all, or only a few scanty pieces. A deficiency in the uterine lining thus already exists in some patients and one wonders if such patients would develop a placenta accreta if they became pregnant. The concept that an ovum could become imbedded in the uterine muscle in the absence of endometrium is supported by the occurrence of primary abdominal pregnancy where the villi become attached to intra-abdominal viscera. It is noteworthy that in abdominal pregnancy the placenta is very adherent and is better left *in situ*.

Histological study has shown minor variations in all cases, but has confirmed the absence of decidua or its presence as an occasional group of cells usually surrounded by fibrin. The distribution of the fibrin has been very variable, some sections showing very little, others having a thick layer between villi and muscle. It did not appear that there was any excess fibrin deposition as a protective layer between the villi and muscle to compensate for the absent decidua. Studies of normal chorio-decidual attachments showed that fibrin deposition was just as variable. Irving and Hertig suggested that Nitabuch's fibrin striae is absent as its development is a function of the decidua, but the present findings indicate that both Nitabuch's and Rohr's striae may persist, usually fusing together.

The chorionic plate is infrequently seen, probably because most of the cases occurred after the 36th week of pregnancy when the chorionic plate is usually becoming degenerate.

The superficial layers of uterine muscle show varying degrees of hyalinization, in some cases very marked, especially where the placenta is penetrating deeply into the muscle. The hyaline changes may be due to the digestive activities of the trophoblastic enzymes. Some groups of large cells are occasionally seen enmeshed in areas of hyalinization and fibrin deposition. Irving and Hertig considered that they were trophoblastic in origin but they do not bear resemblance to any trophoblastic cell and are probably decidual cells or altered muscle cells.

Clinically, post-partum haemorrhage is more common than might be thought, but is explained by the fact that almost half the cases are partial placenta accreta. Acute inversion of the uterus is not uncommon and its occurrence should put one on guard that there may be a placenta accreta. In addition to replacement of the uterus everything should be in readiness for hysterectomy.

The foetal prognosis is good. Placenta accreta does not affect the development of the child or cause a rise in the perinatal mortality.

In the great majority of cases, the safest treatment is hysterectomy. A few cases of complete placenta accreta have been treated conservatively with success, but usually before the true nature of affairs is appreciated some attempts will have been made to remove the placenta and they will naturally cause haemorrhage which may be uncontrollable except by hysterectomy. If, however, there is no bleeding following attempted removal and the bulk of the placenta seems firmly attached, then it would be reasonable

to adopt a conservative attitude and leave the placenta *in situ*. Even in these circumstances there is still a considerable risk of secondary post-partum haemorrhage some days later. A prompt hysterectomy is then imperative. Discovery during Caesarean section is fortuitous, both for the patient and for the obstetrician; the exact extent of the placenta accreta can be quickly appreciated and a rapid decision made with regard to conservative treatment or immediate hysterectomy.

Summary

(1) A clinical and pathological study has been made of 14 confirmed cases of placenta accreta, 6 partial and 8 complete.

(2) Deep penetration (increta) occurred in 6 cases, and perforation of the uterus (percreta) occurred once.

(3) A primary decidual deficiency, possibly hormonal, is considered to be the underlying cause.

(4) Detailed comparison has been made histologically with a large number of normal chorio-decidual junctions.

(5) The salient histological features are absent decidua, a dense fibrin layer representing fusion of Nitabuch's and Rohr's striae, and hyalinization of the uterine muscle.

(6) The safest treatment is by hysterectomy. Rarely, a complete placenta accreta may be left *in situ*.

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THE TEACHING OF OBSTETRICS*

New Edition

BY

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COMYNS BERKELEY in 1929 dealt with nearly the same subject as I have chosen for today, but it occurred to me that now was a good time to take stock of what has happened affecting obstetric education since then. I will try to summarize the trends of the last 30 years, and give you my ideas about the future. This address has been written before the publication of the Cranbrook report and therefore in ignorance of its contents. Though in the main I hold the official views of the Royal College of Obstetricians and Gynaecologists as expressed in their Report on the Obstetric Service under the National Health Service published in July, 1954—I was indeed a member of the Committee that drew up the report—I am here expressing my own personal views, for which the College has no responsibility whatever. I should like to acknowledge my debt to the heads of the departments of obstetrics and gynaecology in Great Britain and Northern Ireland, most of whom answered a questionnaire which I sent them in 1950, and all of whom did me a similar favour last year.

Berkeley (1929) in his lecture summarized the important events in the history of student education in obstetrics between 1858, a hundred years ago, when the General Medical Council was constituted and first met, and 1929, the date at which he spoke. I will not recapitulate these, but will comment briefly on one of his statements, which reads: "It may be said, without fear of contradiction, that any improvement in the training of students in midwifery and diseases of women, and any increase in the facilities for teaching have been entirely due to the teachers in midwifery and to the General Medical Council."

This is to my mind too sweeping. The teachers and the General Medical Council indeed played a large part in securing the improvement, but it should not be forgotten that, as Berkeley states, in 1890 Dr. Rentoul, at the behest of 337 general practitioners, forwarded a petition on the subject of midwifery training to the General Medical Council. In 1895 and in 1900 the British Medical Association played its part in stimulating the Council. My point is that some of the general practitioners themselves realized how unsatisfactory training was, and made an effort to have it improved.

It is noteworthy that Berkeley, though he was Chairman of the Central Midwives Board from 1936 until his death in 1946, fully appreciated how the education of the midwife was interfering with that of the medical student, and his Board took a step, described later, which it was hoped would improve the students' position.

Since 1929 the main events with a bearing on my subject have been the gradually increasing number of confinements in hospital, the introduction of the National Health Service in 1948, and the establishment of the pre-registration year of postgraduate resident appointments in 1953.

Turning to a more detailed survey, I should like to begin by saying this. The assumption is often made that it is possible to make of the student a technically efficient obstetrician for

* The Lloyd Roberts Memorial Lecture delivered at Manchester, 31st October, 1958.

general practice during his undergraduate training. This is not so, nor do I believe that such a fatuous claim has ever been made by a teacher of obstetrics. Since 35 years ago, when I was serving as an obstetric clerk in Leeds Maternity Hospital, the teaching of obstetrics has greatly improved, in antenatal, in intranatal and in postnatal care. It is still, however, quite impossible to teach the technical skills required by the general practitioner obstetrician to the large numbers involved in the short time available. Not only is it impossible, but also in my view undesirable. On the other hand, a sound basic knowledge of obstetrics and gynaecology is no less essential to the student than a similar knowledge of medicine and surgery. To quote Eardley Holland (1945): "It cannot be too strongly emphasized that even though only a certain proportion of those who qualify as doctors ever practise obstetrics, a knowledge of the subject is necessary for all who practise Medicine in whatever capacity. The state of pregnancy may greatly modify the course of certain diseases, and certain diseases may equally have their effect on the course of pregnancy. Woman, indeed, cannot be understood, in health or unhealth, without a knowledge of her reproductive system and function." If a man or woman applies for and obtains for six months a postgraduate resident appointment in obstetrics, it can be assumed that he is specially interested in it and wishes to practise it; then is the time for him to learn additional techniques such as forceps delivery. I also much prefer to let *him* do many perineal repairs, rather than try to see that each medical student does one during his obstetric appointment. The Diploma in Obstetrics of the Royal College, which he can sit for after this is obviously, as Dr. Annis Gillie has pointed out, "not a final test of experience", but it means that a man has not wasted his six months obstetric appointment and that he can think of the right thing to do at a moment of stress. It is also good for his *amour-propre*. While he is a student, before he is quite certain whether he is going to become a general practitioner, a physiologist, a surgeon, or what you will, we try to see that he learns certain essentials. These are the principles and practice of antenatal supervision, the management of labour and the puerperium, the recognition of the abnormal, first aid in emergency, and how to decide whether to keep the patient at home or move her to hospital; to these must be added instruction in neonatal paediatrics by the paediatrician. These, be it noted, are the subjects on which examiners in the Final should concentrate. We have little enough time to instil these important lessons. As W. F. T. Haultain (1949), among others, has said, "the most recent graduate is no more capable of undertaking any but the simplest midwifery cases than he is to practise abdominal surgery".

My questionnaire to the heads of departments included the following:

(1) Where do your medical students obtain their obstetric cases, and how many do they average in each hospital, where they take them?

(2) What arrangements are there for teaching
(*a*) in the teaching hospital?
(*b*) outside it?

(3) If they take cases and have teaching outside the teaching hospital, how do they manage about their systematic lectures at the medical school in term time?

(4) Is there a clash between the interests of pupil midwives and medical students in the hospitals where they work?

(5) Are you in favour of the arrangement suggested in the Goodenough Report, whereby students take all their cases in the teaching hospital, the cases being nursed by pupils who take their cases in another hospital?

(6) Would you care to comment on the recommendation of the General Medical Council (now superseded) that the students should attend a minimum of 12 cases?

In the replies to these questions several other opinions held by teaching obstetricians have emerged.

In considering the answers to the first question, on the number of patients delivered, let us face frankly the difficulties involved in training pupil midwives and medical students in the same unit. In most maternity units in the United Kingdom pupil midwives only are

trained, so that all efforts can be concentrated on their training. In a few units medical students are trained, and in most of them, especially outside London, pupil midwives are also under instruction, and there is nearly always a clash of interests, in which the midwife interest prevails. This is because certification of cases taken by the pupil midwife has always been strict, while for medical students it has often been lax. In other words, the pupil midwife always gets her required number of cases, while the medical student does not necessarily do so. Also, where the two types of trainee are present the trained midwife staff is usually more interested in training the pupil midwife. In some of the London teaching hospitals students only are trained, but generally the units are not large enough to afford complete training, and some part of the obstetric appointment has to be spent elsewhere, mainly in order to obtain deliveries. If students only are trained, the problem arises how to get the patients nursed, and as far as I can see, this entails either the use of nurses in general training or the implementing of the suggestion in the Goodenough report on medical schools which reads:

> "In view of the obligation of a teaching hospital in respect of the training of medical students, pupil midwives should not be permitted to conduct deliveries in such a hospital as part of their course of training, unless the total number of confinements taking place in the hospital and available for teaching purposes is such that, after each student has attended the prescribed number of deliveries, there is a sufficient surplus to permit the hospital to qualify as a training school for pupil-midwives. There would be no objection, so far as the training of medical students is concerned, and possible advantages might accrue to the hospital, if arrangements could be made for parts of the pupil-midwife's training, other than the conduct of deliveries (for example, antenatal work and the nursing of lying-in women) to be conducted in the teaching hospital, the remainder of the training being given in an institution that does not train medical students."

This makes it clear that the Goodenough Committee (1944) thought the position of the students needed protection. In any case, they must have a hospital with an adequate nursing staff to work in.

The Goodenough suggestion has the advantage that it moves the pupil midwives about instead of moving the medical students. But few matrons like the arrangement whereby the pupil does antenatal and puerperal nursing in the teaching hospital and the rest of her training, including the taking of deliveries, in another institution. Several departmental heads dislike it on behalf of the pupils; one says, "The training is uneven—they feel they belong to neither hospital." In commenting on the point several say that pupils and students should be trained together; one of them says it improves the standard of both. On the other hand we know that countries with excellent obstetric records like Sweden and Denmark train pupils and students quite separately, and some heads of departments advocate this system unasked.

In 1938, while Berkeley was Chairman, the training for the Central Midwives Board Certificate was divided into two parts, because many women took the C.M.B. training merely to improve their chances of professional advancement, and it was hoped that subsequently health visitors and hospitals would be satisfied with the First Certificate. This has been largely a vain hope, and in 1948 the *Lancet* stated that "the demand of employing authorities that many nurses, other than midwives, should hold a midwifery qualification wastes the hospital's staff, the nurse's time, and the country's money". It also has an adverse effect on the training of doctors. All the provincial teaching hospitals are Part I training schools under the Central Midwives Board.

The following figures relating to midwives, for which I am indebted to the Secretary of the Central Midwives Board, are of interest and underline the *Lancet* comment:

2,946 midwives qualified in 1953
of these 1,369 practised in 1953/1954
1,116 practised in 1954/1955
901 practised in 1955/1956
735 practised in 1956/1957
639 practised in 1957/1958

2,978 midwives qualified in 1954
of these 1,303 practised in 1954/1955
1,138 practised in 1955/1956
852 practised in 1956/1957
728 practised in 1957/1958
3,021 midwives qualified in 1955
of these 1,415 practised in 1955/1956
1,198 practised in 1956/1957
882 practised in 1957/1958
2,957 midwives qualified in 1956
of these 1,483 practised in 1956/1957
1,068 practised in 1957/1958
2,990 midwives qualified in 1957
of these 1,509 practised in 1957/1958

In all these years only about half of the midwives qualifying in a given year practised, in the following year nearly always less than half, and a rapidly decreasing number practise in succeeding years.

The following figures show that from about two-thirds to three-quarters of pupils passing Part I of the C.M.B. Examination in recent years have started their training for Part II.

	Number of Pupil-Midwives Who Passed the First Examination	*Number of Pupil-Midwives Who Commenced Second Period Training*
1956/57 ..	3,814	2,618
1955/56 ..	3,956	2,953
1954/55 ..	4,055	3,014
1953/54 ..	3,838	2,795
1952/53 ..	3,697	2,809

The practice of using nurses in general training for maternity nursing is on the increase. Many London schools use them because they have no pupil midwives, and others who are short of trainees have begun to make up with general nurses. At least eight of the London departments approve of the practice, and at least four of the extra-metropolitan schools.

Two chair-holders envisage an increasing use of maternity nurses as the hospital confinement rate rises. Views on the length of time a nurse in general training should be attached to a maternity unit vary from "two to three months the limit", "limited to three months", to "at least six months".

Preliminary discussions are taking place between the General Nursing Council and the Central Midwives Board on the question of all nurses in general training doing three or four months obstetric nursing in the course of it, and I understand that there is every hope of agreement being reached. The figures showing the rapid wastage of qualified midwives indicate how desirable it is that this should be done.

The former General Medical Council recommendation about the number of cases reads that students should attend a minimum of 12; the latest states merely an "adequate" number. It is widely appreciated that an "adequate" number to be attended will vary according to whether the student, when qualified, is going to practise midwifery or not. At present, except where the local authority is enlightened, anyone qualifying may indulge in midwifery practice as soon as he is registered, so that the more experience he gets as a student, the better. The College view expressed in its report on the obstetric service is that "evidence of postgraduate training in obstetrics should be a prerequisite for admission to the obstetric list". The Royal College of Midwives has expressed itself in the same sense.

Continued regular experience in practice is also essential. Hadfield (1953), in his field survey of general practice 1951–52, found that general practitioners appeared to be divided into approximately equal thirds in their attitude to midwifery: "one-third dislike it, and have discontinued it entirely or are anxious to cut it down to a minimum; one-third are not very attracted to midwifery, but, feeling that it is a necessary part of the practice, do some; and one-third are keen on midwifery, regarding it as an essential part of general practice and endeavouring to do as much as possible." It is from this last third that the general practitioner obstetricians should be drawn. Antipathy and indifference do not make for good work.

It is appreciated that all rural practitioners should be required to practise midwifery, and "beds should be provided for uncomplicated cases in maternity homes staffed by general practitioner obstetricians" (Royal College of Obstetricians and Gynaecologists, 1954).

Many heads of departments consider that 12 cases are enough for the student if he is not liable to practise midwifery without further experience, whereas 20 or more should be attended if he is so liable. At least two think that number has been over-stressed, and I agree; the reason for emphasizing the number is that it is an obvious way of indicating to the midwife authorities that if the doctor is liable to be called in by a midwife he must have adequate experience of labours and deliveries; and she has taken 30 in her training. Several emphasize the quality of the attendance. It would be ideal if the student could follow his patient all through pregnancy, labour and the puerperium. The curriculum committee of the British Medical Association stated that each case should be allotted to a student on the patient's first attendance at the hospital and that he should then be responsible for her right through. This is not possible because most patients book by the time they are eight weeks pregnant, and the student's obstetric appointment is limited in time. Indeed the same curriculum committee which made the recommendation just given advocated a clerkship in obstetrics lasting only two months. The committee unfortunately did not include a teaching obstetrician in its membership; if it had, such an inconsistency would not have been allowed to remain. What can be done is to allot patients who are in the antenatal ward to students on admission, so that they can care for them from then onwards, including the labour, delivery and lying-in. Gammeltoft of Copenhagen (1931) wrote: "The main thing is that the students should be allowed to conduct the labours themselves, under constant supervision, and in such a way that in the normal labours they are instructed how it is possible, by external examination in the great majority of cases, to watch the progress of the labour, hour by hour, and to assess the variations of the heart sounds." Because of some tendency to inertia by both parties, labour ward sisters and students, there are still too many cases not seen by the student until the head is on the perineum; this point requires constant watching.

There is great variation from one school to another in the number of patients delivered by each student, i.e., from 12 at some up to 30 or thereabouts at others. One departmental head thinks that the minimum could be less than 12, and that thorough instruction on abnormal cases is more important than mere numbers; his view is that it would take over 200 cases to achieve manual dexterity. Most people would surely need many less than this for the purpose. The curriculum committee of the British Medical Association (1948, p. 88) advocated the delivery of "at least 20 normal cases".

The main reason why students do part of their training at outside hospitals is in order to obtain what is considered an adequate number of deliveries. In a good many schools, more cases are taken outside than inside the teaching hospital.

I feel strongly that students already spend much too much time travelling about, and that they will receive optimal instruction if they live throughout their appointment in or close to the teaching hospital, instead of going out to hospitals that are sometimes of poorer calibre, where the staff may not have the intense interest in the students which most of us in the teaching hospitals feel.

Two departmental heads admit that they have no control in the outside hospitals and are obviously dissatisfied about this. There are many comments about the teaching in outside hospitals apart from this which indicate a not very satisfactory state of affairs; "Would rather not comment, but regards it as insufficient"; "Teaching not good at one hospital"; "Nothing is known about the teaching"; "There is *some* clinical teaching"; "It is less predictable".

In fairness it should be said that not all the consultants in these auxiliary hospitals are recognized and paid as teachers. Surely they should all have recognition as long as outside units are used. In two schools all the teaching is done in teaching hospitals, and I think, *pace* one head of department who thinks that students should see "how the other half of the world lives", that that is the ideal arrangement. Students can generally see enough variation in practice and teaching inside their own hospital. Because of the presence of pupil midwives in the teaching hospital I have in Leeds to make use of the kind offices of a regional unit to obtain enough cases for delivery—the students get

nearly half of their total there and we are very grateful for this arrangement—but they stay there the minimal length of time, about 4 days, so that they miss very little of the teaching arranged for them at the Maternity Hospital. But they also see very little of the patients delivered in these four days, because they have observed little if any of their pregnancies, and they can see very little of their puerperal progress. Surely the ideal arrangement is for them to do all their midwifery in one unit, so that they have the maximum opportunities for following all their patients right through. This "saves time, concentrates the teaching, and ensures adequate supervision" (British Medical Association, 1948, p. 89).

As long ago as 1929, the year of Berkeley's Lloyd Roberts lecture, the Departmental Committee on the Training and Employment of Midwives (Ministry of Health, 1929) reported as follows: "It is not merely in the interests of medical education, but in the interests of the mothers that the obstetric teaching of the medical student should be as thorough as possible. Taking a broad view of the whole position and having due regard to the future as well as to the present, we have reached the conclusion that, as urged by a few witnesses, some restrictions upon the training of pupil midwives in hospitals attached to medical schools are necessary. We recommend, therefore, that students in a medical school area should have preference in the apportionment of material, and that pupil midwives in that area should be allowed to make use of such material only in so far as it is in excess of the needs of medical students. If pupil midwives in course of training in connection with a medical school are not able to obtain a sufficient number of cases to qualify for entrance to the examination of the Central Midwives Board, they should be required to go elsewhere for this purpose." Little notice was taken of this recommendation, and the state of affairs is still unfortunately much the same.

I object to the idea that normal delivery is a job for the midwife only, and beneath the doctor. In my view no man can be truly described as practising midwifery who does not see his patients in labour and attend them at delivery. As you know, in England and Wales and in Scotland the doctor can qualify for his full fee without attending labour. This is not so in Northern Ireland, nor in the Dominions. While 21 per cent of doctors attend labour in England and Wales, 81 per cent do so in Northern Ireland. There is no reason why the doctor should not be at least as skilful at delivery as the midwife, provided he gets the necessary experience. Another point seldom publicized when medical attendance is under discussion is this. Delivery is the culmination of eight months' hopes and fears. At this time the doctor should personally support his patient and share her joy. It is difficult to see how he can take more than a half-hearted interest in her unless he himself is to be present at the event to which the whole of the antenatal care leads up. This is well appreciated by the best doctors. At the British Congress of Obstetrics and Gynaecology in 1955, Jameson, a general practitioner, stated that he and one assistant had between them attended at least 90 per cent of over 300 confinements during the previous two years. Quite apart from this, if the doctor is not there, there will be less than the optimal number of episiotomies and of forceps deliveries, both because it takes time to get him and because under the present set-up many midwives feel that they lose face when they call him in. It is also difficult for a man to recognize the abnormal if he does not see enough of the normal as a contrast.

By the student, normal deliveries are usually enjoyed because they frequently offer the first opportunity he has of carrying out a practical manœuvre. I hope that as the body of general practitioner obstetricians become better trained, and this process *is* going on slowly but steadily, they will gradually oust the midwife from her commanding position in the maternity service. I do not see why the entity of midwife, as opposed to maternity nurse, should necessarily persist. The main reason for the midwife's position is probably historical; the man midwife is a fairly recent intruder, and we have not advanced very far since the day when William Hunter waited in the ante-room while Mrs. Draper, who considered she could manage well enough without male help, ushered the future George IV into the world. Why if it is universal

for a nurse to look after a medical patient for a doctor, or a surgical patient for a surgeon, should it not become universal for a maternity nurse to look after a maternity patient for a general practitioner obstetrician?

An incidental discovery from the replies to the questionnaire is that many schools have lost their enthusiasm for systematic lectures in obstetrics. One school considers lectures very important to ensure covering the whole subject. In my view the 5th and 6th year student should be quite capable of supplementing as necessary his clinical teaching, which is abundant, by reading. I again quote Gammeltoft (1931), who wrote, "I give very few strictly theoretical lectures. Nor do I find that such lectures are required. The students have their textbooks, which, it seems to me, render most theoretical lectures unnecessary." Another British school has a large number of lectures (65), but this is two-thirds of the number given in 1950 (100), and when lectures are "compulsory" this is well advertised beforehand. Obviously they are coming to see the light. Other comments include "We tend to abolish set lectures; there are tutorials and a few clinical lectures". "Not much attention is paid to lectures; we go in for tutorials." "There are no systematic lectures." Lectures are voluntary in at least three schools; at another between six and twelve a quarter are given, i.e., to each set of resident obstetric students. One school always gives introductory lectures before a new set of students come in, one on the menstrual cycle and one on labour, and the students during their appointment attend the lectures given to the pupil midwives.

If lectures are to be given covering the whole subject it is virtually impossible to give them to all students while they are doing practical obstetrics; they usually attend them some time before their practical work starts, and this is not a good system, because they forget nearly all of it. I think they derive more benefit from a few lectures on selected subjects while they are doing their resident obstetrics. Often lectures in other subjects are being given during the obstetric appointment. I should like them to be excused all other commitments while on obstetrics, but this has not so far proved practicable. It is difficult for colleagues in other departments to appreciate that every maternity case is an emergency.

You will have gathered while I have been speaking that I am whole-heartedly in favour of the view of the Royal College that obstetric lists should be limited to doctors who have had six months resident postgraduate training. Until this becomes a rule the general practitioner can never take his proper place in the maternity services. The present basic training of students in midwifery should be continued with the length of the appointment unreduced. At that stage, few students know whether they will ultimately practise midwifery or not. In that august body, the General Medical Council, reduction of the training was recently suggested, but after discussion no recommendation was made about it. The number of set lectures should be minimal, with frequent attendance at ward rounds, out-patients and tutorial classes. The student should receive his basic training in one teaching unit, unhampered by the demands of pupil midwives. He should so far as possible follow all his patients from start to finish.

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EVALUATION OF METHODS OF TREATMENT OF URINARY FISTULAE IN WOMEN

A Report of 220 Cases

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THIS study is mainly an analysis of the author's experience in the management of 220 patients suffering from urinary fistulae during the years 1941–1956.

The treatment of fistula is strictly an operative procedure. The basic feature in all techniques is the same, namely anatomical repair under no tension. The approach, however, may differ according to the variety, extent and position of the fistula as well as upon the special training of the operator and his dexterity.

Before going through these points it is well to consider certain features in the development of our knowledge of the surgical treatment.

HISTORICAL CONSIDERATION

As stated by Kelly (1896) and Mahfouz (1938), Van Roonhuysen in 1663 was the first to put into execution a well-defined plan of operative treatment. The technique, though elementary in nature, was at the time considered a great achievement but the hopes aroused by the great surgeon faded and the operation was soon forgotten. Two centuries later, new interest was aroused by the advent of the Sims operation in 1862, although, as Miller (1935) has shown, individual efforts are recorded now and then during this long period. For example, Jobert De Lambelle operated on a large number of fistulae with considerable success. He was probably the surgeon to whom falls the credit of emphasizing the importance of avoiding tension on the suture line by incising the lateral vaginal walls or by detaching the bladder from the underlying cervix and also of emphasizing the advantage of pulling down the cervix by volsellum to render the operative field accessible.

Marion Sims of Alabama in 1862 published a cure of 230 out of 310 cases. His method consisted essentially in paring the edges in a funnel form down to but not including the mucosa of the bladder. The edges were brought together by silver wire sutures which was an undoubted improvement. The sutures were carefully placed so that each stratum was individually sutured. Luke (1850) and others employed silver wire in closing fistulae.

Herbert Spencer (1916) of London, employed the Sims method extensively for many years (38 years) with considerable success. Various instruments were devised to help the fistula surgeon in his effort. Even at the present time there are some surgeons who still adhere to the Sims technique. Aldridge (1953) states that some members on the staff at the Women's Hospital, New York, still believe that the Sims operation and the use of silver wire have no equally reliable substitute to prevent tissue reaction. Aldridge is convinced, however, that it is best suited only for small urethral or bladder fistulae, which are reasonably accessible and

located on relatively flat surfaces. Wound healing is not always as solid as that following other techniques where catgut is used.

These imperfections were a stimulus in the search for better techniques and better suture material. Thus, Maurice Henry Collis (1861) of Dublin devised the ingenious operation of flap splitting. This ushered in a new era in the cure of fistula. The operation was later recommended and popularized by Martin (1890), Sanger (1888), Fritsch (1891), Trendelenburg (1890) and others. Mackenrodt in 1894 recommended the free mobilization of the bladder.

Between the years 1881–1890, Trendelenburg described and perfected the suprapubic extraperitoneal transvesical route which he advocated for the high inaccessible fistulae and for vault fistulae after total hysterectomy. Great contributors like Mayer and Kelly (1891–1898) have shown that the transperitoneal approach is feasible. Young (1927), Sears (1929), Douglas (1937), and Falk and Bunkin (1951) have recommended and improved this technique. The transperitoneal route, however, is the one recommended by the urologist.

Von Dittel (1893) devised the transperitoneal approach where the bladder is dissected from the cervix and vagina, and the fistula closed by catgut. According to Kustner (1922), the credit for devising this method should fall to Zweifel. Legueu (1913), Saenger (1929), Walters (1937) and Counseller (1942) advocated and popularized this approach.

Continued efforts were done in the past to master the difficult, extensive and immobile fistula. Thus Freund (1895) devised a method where the body of the uterus is sutured into the defect in extensive fistulae; Kelly (1896) closed the fistula by detaching the bladder posteriorly and suturing it to the denuded vaginal wall anteriorly in a large inoperable fistula which could not be handled by the classical flap-splitting operation; Martin of Berlin (quoted by Kelly, 1896) devised a method of closure by turning up a vaginal flap to form the base of the bladder. Dudley (1886), Vulliet (1887) and McGill of Leeds (1890) also devised methods to overcome the extensive fistulae.

In 1913, Latzko advocated a partial colpocleisis which is a modification of the original Simon's technique reported in 1855–67. This technique consisted of denuding a ring of vaginal mucosa near the fistula and the wound surface was sutured with sagittally applied stitches. Simon (1854) reported 12 cures for 12 obstetrical fistulae. The original Simon operation had two disadvantages: firstly, a diverticulum might occur, favouring stone formation and, secondly, the patient menstruated through her bladder. Latzko modified the discarded operation and recommended it only for cases following total hysterectomy. The denuded vaginal flap is used to cover the rent in the bladder wall which is not sutured since very soon after the operation a thin layer of the bladder epithelium will erupt and cover the raw surface obviating therefore the possibility of diverticulum. Latzko reported (1942) 31 cases cured by his technique.

Mahfouz (1938) advocated a special technique for cases in which there is an annular sloughing of the bladder neck and adjacent urethra. The contracted bladder is usually separated from the sloughed urethra by dense scar tissue. The technique consists in removing the scar tissue as an essential step before free mobilization of the bladder in all directions. The mobilized bladder is then brought to the urethra and anastomosis is carried out in a fan-shaped manner. When tension exists, he recommends fixing the bladder flaps to the pubic arch as near to the urethra as possible. A residual hole is dealt with at a subsequent sitting. I have personally practised this technique on 4 occasions and have succeeded in closing the rent in 3 at the first attempt. The fourth case required a second sitting to close a small residual opening.

Aetiology

These injuries were inflicted during the course of spontaneous deliveries, during instrumental labours, or during the course of abdominal or vaginal procedures. Cases which resulted from damage incurred by malignant neoplasms alone or in combination with radium treatment are not uncommon but are not included in this report. Traumatic injuries other than those due to obstetric and surgical operations are few in

number (3 in 220), and include 2 cases of defloration in recently married women and one case with a history of fall on a pointed object.

Surgical trauma accounted for only 11·3 per cent of cases. This group includes, among others, injuries during operations for ruptured uterus, vaginal plastic and other vaginal operations, lower segment Caesarean section, one case following accidental ligature of the ureter in the course of a panhysterectomy for chorion-epithelioma, one case following abdominal ovariotomy for an old adherent broad ligament cyst and one after the Wertheim operation. It appears reasonable, therefore, to group the aetiology in this report under four headings (Table I).

TABLE I

Aetiology	Number of Cases
Obstetric causes	191
Surgical trauma	25
Accidental trauma	3
Bilharzial origin	1
Total	220

In a small group of 38 cases treated by the author (part of this report) at Kitchener's Memorial Hospital (Cairo) during the years 1947–55, 15 cases had immediate incontinence after an obstetrical operation, 19 cases followed prolongation of the second stage, while the rest, 4 cases, resulted from surgical operations.

TABLE II

Factor	Number of Cases	Per-centage
Prolonged second stage	19	50
Obstetrical operations	15	39·5
Surgical operations	4	10·5
Total	38	100·0

The role of the "Daia" or the non-professional midwife in Egypt's obstetrics is nearly over. Her place has been taken over by the educated licensed midwife and doctor. This change for the better is marked by a tremendous fall in the incidence of fistula in general and of necrotic fistula in particular. But the incidence of traumatic fistula has gone up, a state for which the inexperienced general practitioner and the over-zealous obstetrician are responsible. The incidence of Caesarean section, it is true, has mounted steeply in the past 20 years or so but still many cases are untimely or unskilfully handled by forceps. The incidence of surgical fistula is also increasing but this is only natural since the scope of gynaecology is getting wider as years pass.

TYPES IN RELATION TO AETIOLOGY

Almost all varieties of fistula are included in this report. They have been grouped according to their position in the genital tract.

TABLE III

Varieties of Fistulae with Incidence in Relation to Aetiology Type

Aetiology	Vesico-		Urethro-			Vault	Uretero-			Total	Per cent
	Vaginal	Cervical	Vaginal	Vesico-Vaginal	Bladder Neck		Vaginal	Cervical	Ab-dominal		
Obstetric trauma	136	12	12	16	4	2	6	3		191	86·8
Post-operative:										25	11·3
1. Hysterectomy:											
A. Subtotal		1						2			
B. Total	4					1	2				
C. Wertheim	1										
2. Vaginal plastic	4										
3. Ovariotomy									1		
4. Lower segment Caesarean section	3	3				1		1			
5. Sterility operation		1									
Other trauma, defloration, etc.	3									3	1·3
Bilharzia	1									1	
Total	152	17	12	16	4	4	8	6	1	220	

The first group is the vesical group which includes 136 vesico-vaginal and 12 vesico-cervical fistulae. It is the largest group and most varied in aetiology. The majority of the vesico-vaginal and almost all the cervico-vaginal fistulae were reported following an operative vaginal delivery. Some developed after total hysterectomy (4 cases), one after subtotal hysterectomy and one after a Wertheim's operation. Six cases were reported after lower segment Caesarean; 4 cases after plastic vaginal operations; 2 cases after defloration; 1 case after fall on a pointed object, and 1 case was associated with bilharziasis. This group includes the largest fistulae encountered, some of them admitting 3 finger-tips or more. The amount of scarring also varied. Sometimes the bladder is reduced to a cavity that admits a finger with difficulty. Such cases were only candidates for the transplantation operation. Sometimes the fistula is obscured by a ring of scar. Sometimes redundancy of the vesical mucosa was marked leading to protrusion through the communicating orifice. Such redundancy has to be looked for since it is a favourable sign, but one has to look for the ureter at the edge in the region of the trigone. In 2 cases jets of urine at rhythmic intervals indicated the position. The insertion of a probe establishes the diagnosis. More than one fistula had been discovered in 4 cases, when the patient was not continent after an apparently successful operation.

The second group is the urethral group of 32 cases, including both urethro-vaginal and urethro-vesico-vaginal fistulae. These latter include the pure bladder neck fistulae. The urethro-vaginal are the most difficult to deal with because of scarcity of tissue since the majority resulted from pressure necrosis.

The third group is the vault fistulae (4 cases). This group is marked by excessive scarring and adhesions and fixation of the cervix. The author preferred to approach 3 cases transperitoneally, and 1 case by partial colpocleisis.

The fourth group is the ureteral group of 15 cases.

Operability and Clinical Results

No patient should be denied some surgical procedure or other in an endeavour to cure her since after several attempts a seemingly hopeless and intractable case may be cured.

Previous attempts elsewhere or by the operator himself should not prevent further trials; the majority were given the chance of a plastic operation with a final cure in a large number. Local infection, purulent cystitis and ascending infection were properly handled before the attempt even if it took weeks or months to overcome. The operation should, however, not be performed before 6–8 weeks after injury. Meantime, anaemia, debility and bad kidney function, constant features of the fistula patient, should be treated.

The extent of the fistulous opening has never been a criterion of difficulty at all. A very favourable case is one with a wide opening where the bladder wall had inverted through the fistula.

Dense scarring of the vagina and extensive fibrosis of the tissues surrounding the fistula can be overcome by patient dissection and mobilization. Bleeding from such dissection may be very troublesome and annoying but should not discourage one since the oozing gets better at the end of the operation, but in 5 cases it persisted and vaginal packing was required in 4 patients for many hours without affecting the ultimate result. In one case, however, the bleeding persisted and destroyed each of 4 successful attempts; surprisingly no post-operative bleeding occurred at the transplantation operation, advised later.

Atresia of the vagina and rings of constriction can be overcome by a generous Schuchardt's incision. This was resorted to on 2 occasions.

The dissection and mobilization of the eccentric fistula in the fornix is only achieved with the greatest difficulty and usually not to the entire satisfaction of the operator. Complete mobilization of the entire lateral wall of the vagina on this side, as suggested to me by Dr. Ingelman-Sundberg (Stockholm), may be of help in such cases.

Vault fistula in relation to the cervix presents no difficulty in the majority of cases, but when the scarring is dense, and the fistula is lying amidst the remains of a badly distorted and firmly fixed cervix, I have on 3 occasions found it advantageous to approach transperitoneally.

The presence of the ureteral openings at the edge of the fistula is no obstacle at all. When only one ureteral opening shows at the edge, the other opening will not be far away. Three such cases were encountered and approached vaginally. The fistula here is usually a large one. The operation differs in no way from the usual except that fine probes or ureteral catheters are inserted into the ureters and left until the sutures are applied well away from the ureteral wall to avoid inclusion and subsequent ureteral fistula. There is no need to dissect and implant the ureters at a higher level in the bladder.

Destruction of the urethra may be partial or complete. The majority were given the benefit of a plastic operation but the results were not always favourable. Transplantation was recommended for some.

Bladder stones were encountered twice and dealt with, vaginally in one case and suprapubically in the other. Recurrence of the fistula may happen as a result of stone formation at the site of operation. Such a stone is usually very small and the resulting minute opening may heal spontaneously.

A Report on the Management of 220 Cases of Urinary Fistulae

Only one case of uretero-abdominal fistula was handled by nephrectomy. All other cases were approached vaginally (185 cases), or abdominally (34 cases).

Vaginal Approach

This route has been and will always be the route of choice to us. In the wards of Kasr El Aini Hospital, the urologist is rarely consulted in the treatment of urinary fistulae and therefore the transvesical route had never been practised in this series. The vaginal approach is undoubtedly safer for the patient and for the future function of the bladder. Suturing through the vagina is more adequate since dissection is wider. A firm union and a more perfect haemostasis can be achieved vaginally. By following the proper technique and by avoiding paring of the edges, post-operative bleeding and clot formation in the bladder is negligible; it occurred in 4 cases and was easily dealt with by lavage and changing of catheter.

Table IV

Operative Procedure

Variety of Fistula	Operation						
	Vaginal Approach		Abdominal Approach				Nephrectomy
	De-doublement	Latzko	Trans-peritoneal	Uretero Colic Trans-plantation	Implantation in Bladder		
1. Vesico-vaginal	146			6			
2. Vesico-cervical	16		1				
3. Urethro-vaginal							
4. Urethro-vesico-vaginal and bladder neck	10			10			
5. Vault		1	3				
6. Uretero-vaginal					8		
7. Uretero-cervico-vaginal					6		
8. Uretero-abdominal							1
	184	1	4	16	14		1
Total	185		34				1

Dedoublement was the operation practised in 184 cases and only one case was cured by the Latzko technique. The dedoublement operation is a flap-splitting operation where the vagina around the opening of the fistula is circumcised 1 mm. from the edge. This is complemented by 4 incisions extending in 4 directions from the circular incision (Figs. 1 and 2). The extent of these depends upon the degree of mobilization required. The 4 flaps are dissected best when the line of cleavage is established. Lembert sutures (of 0–00 chromic catgut 20 days) are sagittally applied. Good bites into the bladder muscle under no tension are necessary for a firm union. The lateral angles are given greater care during the suturing. It is well to start about half a centimetre from the margin. In a cervical fistula, the incisions vary by making 1 longitudinal and 2 oblique lateral ones radiating from the circumcising incision.

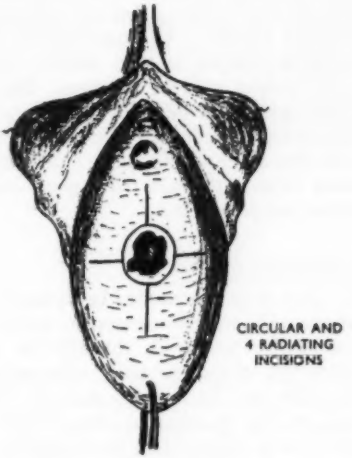

FIG. 1
Showing vaginal incisions.

Paring the precious bladder tissue at the edge has never been practised, since it was found that the thick edge is a great advantage during dissection and insertion of sutures. An added advantage is that at a second attempt the surgeon will not be confronted with a wider and more difficult fistula. The inverted edge will soon be covered by vesical mucosa creeping over.

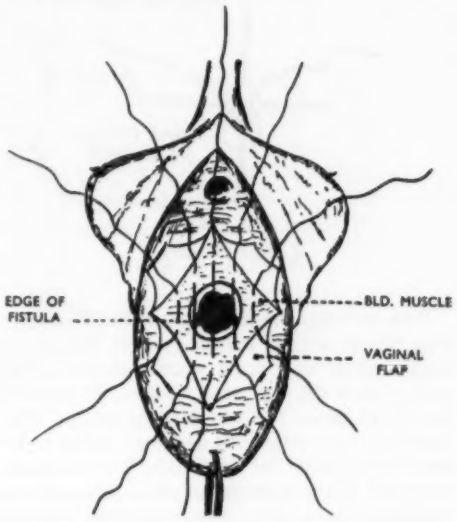

FIG. 2
Vaginal flaps reflected and sutures applied to bladder wall. Note no paring of edge is done.

There is no special plan for closing the vaginal rent. Fine catgut sutures are designed to approximate the wall without tension (Figs. 3 and 4). In a fistula operation the suture material should be of unquestioned reliability. A second attempt in 2 cases was required because of the bad quality of catgut procured by mistake in the hospital.

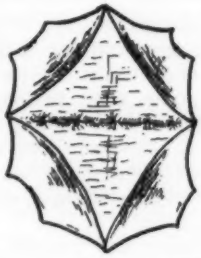

FIG. 3
Shows bladder wall after suturing.

FIG. 4
Closure of vagina.

Post-operative drainage is entrusted to a large bore rubber catheter left for 11 days. Sometimes slight leakage may occur when a stitch loosens on the 5th or 6th day; here, we leave the catheter for 17–18 days. If slight leakage occurs after removal of the catheter it is a good policy to re-insert the catheter for a few days. This is usually rewarded in the majority of cases. The urine is measured two-hourly. Blocking of the catheter or intravesical bleeding is therefore discovered on the spot and dealt with. Routine lavage had never been needed in this series. The patient may be allowed out of bed during the early post-operative period but usually on the 11th day.

ABDOMINAL APPROACH

Under this heading will be discussed the transperitoneal extraperitoneal dedoublement (4 cases), the uretero-colic transplantation (16 cases) and the transperitoneal extraperitoneal implantation of the ureters into the bladder (14 cases).

Transperitoneal Extraperitoneal Dedoublement

This approach was resorted to when it was found easier and more beneficial for dealing with fistulae in relation to the vault: 1 case after total hysterectomy, 1 case after prolonged labour due to cervical fibroid (here total hysterectomy was performed at the same time), and 2 cases where the vault was reduced to a narrow pit that could not allow the tip of a finger, when the cervix had sloughed away.

The procedure is simple and consists of cutting through the vesico-uterine peritoneum from one round ligament to the other and dissecting the bladder downwards until the track of fistula is identified all round (Figs. 5 and 6). The track is then enlarged with the knife and the dissection is carried out more distally to achieve free mobilization that brings the fistula bearing area to a higher level in the operative field. Dedoublement is then carried out, and the vaginal rent is either left unsutured or a few widely spaced sutures are inserted. This ensures sufficient drainage at the site of operation. Any leak from failure is sure to find an outlet through the vaginal opening. The peritoneum of the vesico-uterine pouch is then sutured and the abdomen closed without drainage. The post-operative care is not different in any way from the one mentioned above. Three cases succeeded from the first attempt; the fourth had to undergo a second attempt through the vaginal route for a residual pin-point fistula.

Transplantation of Ureters

This procedure was needed in 16 cases. In 10 it was the only possible treatment, while in the others, one or two trials through the vagina convinced me of the probable ineffectiveness of further attempts. In the majority, the bladder and vagina had sloughed almost completely so that both were reduced to a small scarred cavity that admitted a finger with difficulty. Such a bladder would have never been fit to act as a receptacle for urine even if the operation had

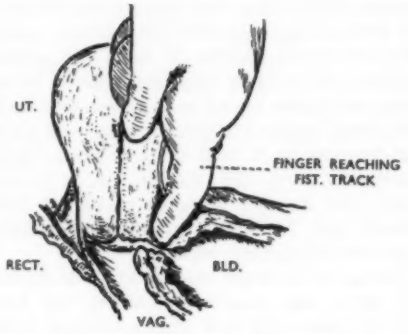

FIG. 5
Finger separating bladder from cervix. Fistula track palpated.

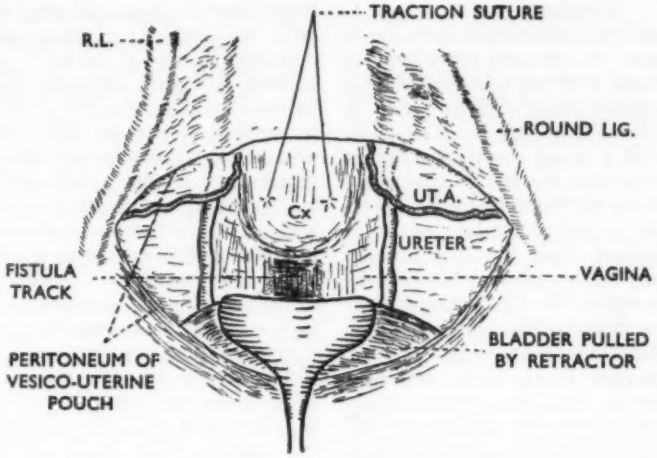

FIG. 6

Bladder retracted anteriorly. Cervix pulled posteriorly and upwards. Vaginal vault exposed demonstrating fistulous track.

succeeded. In some the pubic bone was left hardly lined with tissue. The procedure was used in 1 case which had had repeated unexplained post-operative haemorrhage on 5 vaginal attempts. In 5 cases the sloughing of tissue was so extensive as to destroy both endometrium and cervix; the patients had not seen menstruation before or after operation.

The 16 operations entailed 32 anastomoses carried out by the Coffey II technique without an inlaying catheter. The two-stage operation was performed in the first and third cases; the one-stage operation was used for the rest. This series was not attended by any mortality, leakage or any need to re-operate. The convalescence was stormy in only one case, but the patient pulled through and regained good health; and radiologic examination and kidney function tests proved satisfactory, two months later.

Associated rectovaginal fistulae (3 cases) were dealt with two months after transplantation. Six cases of this association were encountered in the whole series. Four cases became pregnant between 1–6 years after operation and were dealt with by Caesarean section.

The alterations in the blood chemistry resulting from the operation with the syndrome of hyperchloremic acidosis associated with an elevation of non-protein nitrogen, indicating severe renal damage, or due to reabsorption of urinary chlorides from the bowel, had been combated post-operatively with the help provided by both the laboratory and the medical sections in the hospital.

Sulphathalidine and streptomycin by mouth were relied on to sterilize the bowel before the operation. In spite of little spillage which occasionally happened during the time of operation no wound infection or peritonitis was noticed.

Vesical Implantation of the Ureter

Fourteen cases of uretero-vaginal fistulae were dealt with by the transperitoneal approach. They included 8 cases of uretero-vaginal and 6 uretero-cervico-vaginal fistulae. The post-operative course in all cases was uneventful and all patients of this group were discharged cured.

Comment

In this series 90 per cent of cases were due to an obstetric cause. An obstetric operation was the aetiologic factor in 40 per cent. Bilharziasis, although a pertinent cause of male fistula in Egypt, is an extremely rare cause in the female.

No patient with a fistula was denied one or more attempts at cure by the vaginal route which, I believe, is the route of choice for all vesico- and urethro-vaginal fistulae. Success is not always attained from the first attempt particularly when the operation is handled by the occasional surgeon. The first attempt, however, gives the best result and with each succeeding attempt the chances of cure are progressively smaller. In the series presented here many patients had been unsuccessfully treated elsewhere. A second attempt by the vaginal route was done on 8 occasions in cases that failed in the hands of the author, and in 12 cases where the first attempt was carried out elsewhere. In one case three attempts and in one case four attempts were carried out.

During a vaginal approach I have found paring of the edges of the fistula to be harmful since it results in a wider opening should the first attempt fail, thus reducing the chances of final cure. The unpared edges do not (in the least) interfere with the proper healing, on the contrary bleeding from the pared edges may be a menace during and after the operation. The unpared edge provides a point d'appui for adequate suturing. The presence of the ureteral opening at the edge of the fistula does not necessarily add to the difficulty of the operation. Schuchardt's incision was required in only 2 cases, especially when dealing with an eccentric fistula which I believe is one of the most difficult to operate on. Fixity of the cervix in relation to vault fistula was overcome in 3 cases by resorting to the transperitoneal route, and in one case by a preliminary transperitoneal approach followed by a vaginal approach for a pin-point residual fistula. In the excellent paper recently published Chassar Moir (1956) agrees with the excellent benefit of the vaginal approach though I have found the transperitoneal route advantageous in the above-mentioned cases.

The group of cases treated by transplantation (16 cases) represent cases which failed to heal from below (6 cases) and cases which from the start we decided as inoperable (10 cases). Although the size of the fistula, dense scarring, bleeding during the operation, and atresia of the vagina should not discourage the surgeon from proceeding, yet there are cases where the attempt from below is futile especially when the bladder and vagina are reduced by destruction and sloughing to a small pit that hardly admits a finger. These cases are usually associated with complete amenorrhoea due to complete slough of the endometrium.

The longevity after transplantation is definitely high for fistula cases. The longest in this series is 12 years. All the cases that could be traced are still alive at the time of writing this report. Some cases where the ureters were dilated before operation with noticeable hydronephrosis stood the operation well. Some of these cases are apparently better immediately after operation yet undoubtedly the procedure cannot be undertaken without danger from renal damage due to obstruction, infection or both. It is still early to report such happenings in the cases reported here. The "dunking" method recommended by Meigs and other methods of anastomosis devised by Nesbit and Cordonnier which were recently reported to be very satisfactory have not been practised in Kasr El Aini Hospital. Certainly these methods are easier, less traumatic and quicker than the Coffey II but they have the disadvantages of regurgitation and a liability to leakage which have not been encountered here.

Summary

(1) A historical review of the methods of approach in the management of fistula is given.

(2) The aetiology and types of urinary fistulae in Egypt are discussed.

(3) Much of the apprehension associated with the fistula operation is unfounded and perseverance is always rewarded.

(4) The operative approach in the management of 220 cases is described. The approach of choice is the vaginal route; the abdominal approach is only rarely necessary. The transplantation of ureters should be avoided if

possible. It has to be resorted to in some cases where it is futile to operate from below.

(5) All cases of ureteral fistulae were approached abdominally.

(6) Cases that failed to heal by the vaginal route were treated by transplantation of ureters into the colon. The author agrees with Counseller that transplantation has a definite place in the treatment of huge vesico-vaginal fistulae in cases in which the bladder has been rendered incapable of retaining urine.

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THE TREATMENT OF INEFFICIENT UTERINE ACTION WITH THE INTRAVENOUS OXYTOCIN DRIP

A Review of 300 Cases

BY

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ALTHOUGH more than ten years have passed since Theobald and his co-workers (1948) introduced the pitocin drip into clinical obstetrics, this method of treatment still has to win complete acceptance, particularly in conservative obstetric circles. In some hospitals it is used rarely, in others not at all. Even in the United States, where the drip has been welcomed with more enthusiasm, the frequency of use varies considerably: from 1·1 and 2 per cent of patients at Baltimore University and Johns Hopkins Hospital respectively to 27·8 per cent at Beth El, according to a report on 5,656 cases compiled from the records of ten hospitals by Hellman, Kohl and Schechter (1957).

While there has been perhaps less objection to its use for the induction of labour—Gordon Lennon (1957) and Ryan (1958) among others have recently reported on relatively large series of cases—few papers have appeared in the British literature on the treatment of inefficient uterine action by intravenous oxytocin. Yet the management of this condition remains one of the most taxing problems in modern obstetrics. In a review of the cases of uterine inertia at Queen Charlotte's Hospital over a 10-year period, Macrae (1949) reported a maternal mortality of 4·7 per thousand and a foetal loss of 12 per cent when labour was prolonged beyond 48 hours. Sheehan (1948), in his classical paper on death from obstetric shock, noted that 46 of his 147 cases had been in labour three, four or more days. Corbett (1956), commenting on these figures, suggested that surgical intervention should take place much earlier so as to avoid the hazards of long-standing inertia.

Confirmation of the risk to both mother and baby has come from other centres. Sturrock and Brown (1956), reviewing 124 maternal deaths in Edinburgh, found that 31 of the patients had been in labour 30 hours or more. The foetal loss in labours over 30 hours was 9·5 per cent. They concluded that if a cervix had remained unchanged in dilatation for 8 to 12 hours it was doubtful if there was any reason for not terminating labour by Caesarean section. In an analysis of 4,401 primiparous labours, Ostry (1955) contrasted the perinatal loss of 1 or 2 per cent when labour lasted less than 30 hours with the steady rise in mortality to 4 per cent at 36 hours, 7 per cent at 48 hours and 14 per cent at 72 hours. Nixon (1952), who also noted the marked rise in foetal loss after 36 hours, recommended that Caesarean section should be seriously considered if labour continued longer than this.

Nevertheless, to many obstetricians it will seem radical treatment to subject young primiparae—as so many of these patients are—to Caesarean section merely for inefficient uterine action, a condition which rarely recurs in subsequent pregnancies. On the other hand, if conservative treatment is pushed too far, there is the risk that the traumatic experience of the labour, apart from its physical dangers, may affect adversely the patient's approach to future

childbearing. Jeffcoate *et al.* (1952) found that, of 147 patients who suffered from severe inefficient action of the uterus and required delivery by Caesarean section or mid-forceps, more than one-third deliberately avoided further conception.

In the belief that the oxytocin drip, if judiciously employed, offered the best treatment at present available for this condition a planned programme of investigation was instituted in the combined Obstetric units (King Edward VIII Hospital and McCord Zulu Hospital, Durban) of the department of Gynaecology and Obstetrics of the University of Natal.

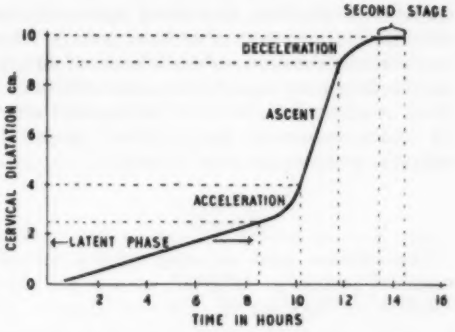

FIG. 1

The sigmoid curve of normal dilatation, based on a study of 500 primigravid labours at term. Once the latent phase has ended dilatation proceeds rapidly. (After Friedman, 1955.)

DEFINITIONS

The fundamental problem in any analysis of inefficient uterine action is that of definition. It is sometimes very difficult to be certain that a patient is in true labour, for not a few patients state that they have had regular pains for several hours—and sometimes for days—but examination of the cervix reveals no dilatation. Again, even in a primiparous patient the cervix may occasionally dilate to one or even two fingers without any other evidence of the onset of labour. Yet, because the only objective criterion of labour must be progressive cervical dilatation, an understanding of the process of normal dilatation becomes an essential pre-requisite to any attempt at definition.

On the basis of careful clinical and cervimetric studies, Friedman (1954, 1955, 1956) has demonstrated a sigmoid curve of normal dilatation (Fig. 1). Four phases are distinguished: an onset phase, which usually lasts about 8 hours; then a phase of acceleration merging into a phase of fairly rapid ascent; and finally a phase of deceleration just before full dilatation. The clinical importance of this graph lies in the observation that progress from about 2-fingers dilatation to 4-fingers or more should take place rapidly—over a period of 4 to 6 hours. A cervix which becomes arrested or static at two or more fingers' dilatation for longer than 6 hours in the presence of painful uterine contractions would therefore appear to indicate inefficient uterine action.

Using the more conventional criterion of length of labour, it could be postulated that any primiparous patient who had not reached half-dilatation after 12 to 18 hours of established labour should be regarded as a case of inefficient uterine action. In this series, the 12-hour criterion was adopted. These definitions may seem too radical, but the 300 consecutive cases of inefficient action reported in this paper represent less than 2 per cent of the total deliveries in the obstetric wards during the same period—a figure which corresponds well with the average reported incidence of 1 to 3 per cent, and indicates that the oxytocin drip has not been employed promiscuously.

Macrae (1949) excluded all cases of cephalopelvic disproportion from his series, and the same policy has been adopted here. It is common cause that the two conditions are frequently associated, but the inclusion of the disproportion cases would only serve to confuse the evaluation of the treatment, for it would be difficult in cases of failure to determine whether the poor uterine action or the disproportion was primarily responsible.

It is also necessary, if any objective conclusion is to be reached, to set some time limit for the evaluation of the oxytocin administration. A drip may be set up and the patient deliver 24 hours later, but it would surely be stretching

credulity to attribute that result necessarily to the drip. In the present series those patients who reached full dilatation within 12 hours of setting up the drip were regarded as successful cases; those in whom full dilatation was reached after 12 hours, whatever the eventual mode of delivery, were regarded as failures.

Method

The solution used was that of 0·4 ml. (4 units) of pitocin in 1,000 ml. of a 5 per cent solution of dextrose in water—a dilution of 1 : 2,500—set up to run at 10 drops a minute. The rate of flow was increased if there was no effective response but rarely beyond 30 drops a minute. When this solution produced tumultuous contractions or contractions lasting longer than 60 seconds either a weaker solution (1 : 5,000) was substituted or the drip was discontinued. Only rarely was a concentration of more than 1 : 2,500 used, and experience indicates that, if the standard dilution fails, the more concentrated ones are likely to prove equally ineffective.

Patients on the pitocin drip were subject to routine labour ward supervision, except that a close watch was kept on maternal pulse and blood pressure, foetal heart readings, descent of the head and the nature of the contractions, observations being recorded every 15 minutes.

No attempt was made to exclude cases on the basis of malpresentation, grande multiparity or type of inefficient uterine action. All patients with cervical stasis of 6 hours or longer or, alternatively, who had been in labour for 12 hours and had failed to reach half-dilatation were treated by the drip—provided that significant disproportion was thought to be absent. In doubtful cases disproportion was excluded by radiographic assessment. The rule as regards time for administration could not always be adhered to as it was sometimes difficult to determine the exact onset of labour, and these cases were initially treated with sedation. A number of patients were only admitted to hospital after a varying period of labour at home. Their general condition often required sedation and correction of acidosis before the drip could be used.

Sedation was used freely as required, and half the patients in the series received one or more injections of pethidine or, occasionally, morphine during the period of pitocin administration. Although a synthetic oxytocin ("Syntocinon") has become available in recent years, and presents certain theoretical advantages while retaining the same oxytocic effect, it seemed wiser to avoid complicating the assessment by changing the agent. Pitocin has therefore been used throughout the series.

Results

Of the 300 patients, 251 (83·7 per cent) were primiparous—an expected finding because inefficient uterine action is mainly a complication of first labours. However, there were also 7 patients who had had more than five deliveries. Thirteen patients (4·3 per cent) were thought to be less than 36-weeks pregnant.

Two hundred and fifty-seven patients reached full dilatation within 12 hours: a success rate of 85·7 per cent (Table I). Almost two-thirds of the cases responded immediately to the drip, reaching full dilatation within 6 hours. In a number of others dilatation proceeded slowly but steadily until full dilatation was reached. There were also 57 cases in which dilatation proceeded in a somewhat unusual manner: the cervix remained virtually unchanged for as long as 6 or 8 hours, after which full dilatation was achieved fairly rapidly within 1 or 2 hours. This reaction has been dubbed a *lag response*.

Table I

Outcome of Labour—300 Patients

	Hours	Cases	Per cent
Full dilatation in ..	0– 3	105	35
	3– 6	86	28·7
	6–12	66	22
Full dilatation after	12	34	11·3
L.S.C.S.		9	3

The 43 failures were treated with sedation. Seventeen of them delivered vaginally between 12 and 30 hours after the commencement of the drip. Nineteen cases were submitted to a repeat pitocin drip after an interval of sedation had

failed to produce any advance and 13 of these reached full dilatation on the second drip, usually fairly rapidly within a period of 3 hours. Of the 6 failures resulting from the second drip, 4 delivered spontaneously and 2 were submitted to Caesarean section. Nine Caesarean sections (3 per cent) were performed in all.

The method of delivery is given in Table II.

TABLE II
Method of Delivery

	Cases	Per cent
Spontaneous vaginal delivery	240	82
Assisted breech delivery ..	6	
Forceps delivery:		
Low	14	15
Mid	31	
L.S.C.S.	9	3

The indications for Caesarean section were foetal distress (4 patients), failure to progress after long labour (3 patients) and maternal distress (2 patients). The forceps rate of 15 per cent represents a marked increase on the overall hospital average of 3·6 per cent. Despite the rapid response in dilatation which usually occurred, contractions in the second stage were not infrequently too poor to permit spontaneous vaginal delivery. The fact that 31 of the 45 instrumental deliveries were mid-forceps applications indicates that progressive descent of the head into the pelvis did not always occur—as would be expected if good uterine action was present—and also excludes a desire to shorten the perineal stage of labour by "prophylactic" forceps as the main reason for the comparatively high rate.

Analysis of Failures

In reviewing the literature on the pitocin drip, Theobald *et al.* (1956) noted that "all authors are agreed that the presenting part must be engaged by its greatest diameter and no abnormality of labour should be present if the pitocin drip is to be used". One would therefore expect more complications and a significantly increased failure rate if the drip were used in such conditions as malpresentations, posterior positions, high head, hypertonic uterine action, etc. The effects on the foetus and other complications are discussed in subsequent sections; the failures are analyzed in greater detail in Tables III to VIII.

The effect of position and presentation is shown in Table III. While there may be a slight

TABLE III
Influence of Presentation and Position on Failure Rate

	Total No. of Cases	No. of Failures	Failures (Per cent)
Occipito-anterior ..	200	26	13·0
Occipito-posterior ..	92	16	17·4
Breech	6	1	16·7
Twin pregnancy ..	2	0	—

increase in the number of failures in posterior positions the rate is not significantly raised. There were only a small number of breech presentations; even so, there is no evidence that the drip could not be successfully used in these cases. It is also of interest to note that, in 300 successive cases of inefficient action, breech presentation occurred 6 times and multiple pregnancy only twice—a fact which does not lend support to the belief that these conditions are frequently associated with inertia. In contrast, there was the expected high incidence of posterior positions.

More than two-thirds of the foetal heads were not engaged in the pelvis at the time the drip was started (Table IV), and in 32 instances the

TABLE IV
Influence of Station of Presenting Part on Failure Rate

	Total No. of Cases	No. of Failures	Failures (Per cent)
High head	32	6	18·8
Head in brim ..	167	21	12·6
Head engaged ..	95	15	16·8
Breech	6	1	16·7

head was high and mobile. It is an observed clinical fact that in the Bantu—who constituted the great majority of patients in this series—the head does not normally engage in the pelvis even

in primiparae until labour is well advanced. In any event, although a high head may be attended by a slightly increased failure rate, it is clear that the head does not need to be engaged for the successful administration of oxytocin.

Theobald *et al.* (1956) believe that rupturing the membranes helps to expedite labour, and their practice is to rupture the membranes after 12 hours of inefficient labour and only set up a pitocin drip if progress does not take place over the following 6 hours. If this were so, it might be expected that the failure rate would be significantly increased in the presence of intact membranes, but no definite evidence of this can be obtained from an analysis of the relevant figures (Table V). Even so, it is a clinical impression that artificial rupture of the membranes,

TABLE V

Influence of Membranes on Failure Rate

	Total No. of Cases	No. of Failures	Failures (Per cent)
Membranes intact ..	144	25	17·4
Membranes ruptured	146	18	12·3
Equivocal	10	0	—

when the patient is not making good progress on the drip, does occasionally accelerate the labour. In 9 cases in which 4- to 6-hours treatment failed to produce rapid dilatation, artificial rupture of the membranes was followed by full dilatation within 3 hours.

According to almost all authorities (Nixon, 1952; Jeffcoate *et al.*, 1952; Kennedy, 1955; Greenhill, 1956; Lewis, 1956), the pitocin drip has no place in the treatment of inefficient uterine action other than that of the hypotonic type. In attempting to assess the effect of the type of uterine action on the failure rate in this series, considerable difficulty was experienced in classifying the cases according to the system proposed by Jeffcoate (1950). Very often no clear-cut definition was possible. However, an attempt was made to distinguish two main groups: hypotonic and inco-ordinate (Table VI). Hypertonic uterine states were included in the inco-ordinate group. There were 159 cases of

TABLE VI

Influence of Uterine Action on Failure Rate

	Total No. of Cases	No. of Failures	Failures (Per cent)
Hypotonic	159	14	8·8
Inco-ordinate ..	42	9	21·4
"Generally inefficient"	92	16	17·4
Rigid cervix	7	4	57·1

hypotonic action—a finding which must immediately cast some doubt on our method of classification, for Jeffcoate *et al.* (1952) believe this type of uterine action is rare—and 42 cases of inco-ordinate action. It was impossible to classify 92 of the cases into either one or other of the main groups and these have therefore been labelled "generally inefficient".

Although undoubtedly the best results (8·8 per cent failures) occurred in the hypotonic group and a fairly high failure rate of 21·4 per cent in the inco-ordinate group, oxytocin may obviously be used with considerable success even in the latter type of uterine action. It is only with the cases of rigid cervix that the failure rate (57·1 per cent) becomes high enough to raise doubts about the effectiveness of the drip, though admittedly there are too few cases to allow a firm assessment. In the indeterminate "generally inefficient" type of uterine action the failure rate lies about half-way between the figures for the two main groups, as would be expected for this group probably contains both hypotonic and inco-ordinate cases.

Both Theobald *et al.* (1956) and Kramer (1957) note that the longer ineffective uterine action is allowed to exist the less effective pitocin is likely to be, but adduce no statistical evidence to support the contention. The failure rate in relation to length of labour and to cervical stasis is shown in Table VII. While the rate remains the same if the drip is set up between 10 and 20 hours or between 20 and 30 hours of labour, once labour has persisted beyond 30 hours the failure rate doubles. Any inference drawn from the relatively small number of cases in the latter group must necessarily be cautious, but if the cases are grouped according to the duration of cervical stasis, the difference

TABLE VII

Influence of Length of Labour and Cervical Stasis on Failure Rate

	Total No. of Cases	No. of Failures	Failures (Per cent)
Length of labour:			
10–20 hours ..	178	22	12·4
20–30 hours ..	83	11	13·3
Over 30 hours ..	39	10	25·6
Cervical stasis:			
Under 10 hours ..	174	17	9·6
Over 10 hours ..	126	26	20·6

On chi-square, p is less than ·02.

in the failure rate becomes statistically significant.

The importance of cervical stasis is further emphasized if those cases which showed a *lag response* in dilatation are included in the analysis. There were 43 failures and 57 cases of lag response. In Table VIII these 100 cases are

TABLE VIII

Lag Response and Failures in Relation to Cervical Stasis
(The terms are defined in the text)

	Total No. of Cases	No. of Lag Response and Failures	Lag Response and Failures (Per cent)
Cervical stasis:			
Under 10 hours	174	36	20·7
Over 10 hours	126	64	50·8

On chi-square, p is less than ·001.

grouped according to the duration of cervical stasis. The difference in failure rate is statistically highly significant, and carries the implication that a lag response in dilatation or failure is much more likely to occur when cervical stasis has persisted beyond 10 hours.

Intra-uterine sepsis was diagnosed in 17 cases, severe infection occurring in 9 of them. There were 5 failures, all of them where severe infection was thought to exist. This finding agrees with the observation of Kramer (1957) that although the uterus may respond to pitocin in the early stages of infection there is often no response once sepsis is established. Even with larger doses (dilutions of 1 : 1,000 or 1 : 500) the septic uterus may remain completely inert.

Cases of definite cephalo-pelvic disproportion were excluded from this series, but minor degrees of pelvic contraction which were not thought to be significant occurred in 47 cases. The failure rate was no higher than in the whole series. Similarly, there was no marked difference in the failure rates in the multiparous patients or in those patients with premature labour.

EFFECTS ON THE FOETUS

Intra-uterine death of the foetus occurred in 10 patients before the drip was started, and these cases may fairly be excluded from the assessment of foetal risk. Thus of the 302 babies born there were 292 at risk. The perinatal loss was 31 per thousand: 6 stillbirths and 3 neonatal deaths. Among the stillbirths tentorial tears and cerebral haemorrhage were discovered in 2 cases (1 breech delivery), asphyxia in 2 others and pneumonia following intra-uterine sepsis in another. A necropsy could not be obtained in the remaining case but a presumptive diagnosis of asphyxia was recorded. The neonatal deaths were attributed to asphyxia (death occurred at 1 hour after a labour of 72 hours), haemorrhage into the scalp and death from shock (death at 14 hours) and atelectasis (death at 3 days).

The overall hospital perinatal loss was 62 per thousand live and stillbirths. The uncorrected foetal loss in this series was 63 per thousand live and stillbirths, and does not suggest that the administration of oxytocin increases the danger to the foetus. Indeed, it would be difficult to believe that the treatment was in any way responsible for 2 of the 3 neonatal deaths.

The foetal loss is too small to be related with any meaning to cervical stasis, length of labour, type of uterine action, etc. To gauge the possible dangers to the foetus in these conditions the records of babies born with moderate or severe degrees of asphyxia and who required resuscitation were analyzed. In Table IX these 20 cases are grouped according to length of labour and cervical stasis. Obviously the risk of asphyxia is markedly increased when the drip is used late in labour than when it is used early. From a

TABLE IX
Asphyxia Rate in Relation to Length of Labour and Cervical Stasis

	Total No. of Cases	No. of Cases of Asphyxia	Asphyxia Rate (Per cent)
Labour:			
Under 30 hours ..	261	9	3·4
Over 30 hours ..	39	11	28·1
(On chi-square, p is less than ·001)			
Cervical stasis:			
Under 10 hours ..	174	8	4·6
Over 10 hours ..	126	12	9·5

statistical viewpoint, it is interesting to note that while the failure rate appears to be more clearly related to cervical stasis (Table VII) the asphyxia rate is related to length of labour rather than to cervical stasis (Table IX). Neither the stillbirth nor the asphyxia rate was increased in incoordinate uterine action, posterior position of the vertex, high station of the head or the presence of ruptured membranes.

Foetal distress was not regarded as a contraindication to the use of the drip or as a reason for discontinuing it. Thirty-seven cases with a vertex presentation showed meconium-stained liquor either before setting up the drip or during the period of administration. There was one stillbirth and one neonatal death. Forty-six cases showed a foetal heart-rate above 160 per minute at some time or other, and there was one stillbirth. A foetal heart-rate below 120 occurred in 14 cases; there was one stillbirth. Thus, of a total of 97 cases who showed one or more of the conventional signs of foetal distress, 4 babies were lost (4·1 per cent mortality). Caesarean sections were performed in only 5 of these 97 cases. None of the cases of foetal distress were attributed to cord complications.

According to Walker (1959), who has analyzed 682 cases of foetal distress occurring in our unit, there is an overall foetal loss of 8·0 per cent if cases of occlusion of the cord are excluded. The foetal loss in cases of distress in this series is well below this figure, and provides no evidence that pitocin used in the presence of meconium or an abnormal heart-rate adversely affects the prognosis for the foetus.

COMPLICATIONS

Rupture of the Uterus. This remains the most feared complication resulting from the use of pitocin before delivery and constitutes the main reason for its infrequent use in many obstetric units. With some irony Montgomery (1958) comments that pitocin does cause rupture of the uterus—although never in reported series. Our total experience of oxytocin drip therapy numbers over 700 cases and, although no ruptures of the uterus occurred in the present series of 300 cases of inefficient uterine action, it is worth reporting briefly 3 cases of rupture of the uterus which occurred in our unit *associated* with the use of intravenous pitocin for the *induction of labour*.

(1) Para-2, aged 23 years. Previous Caesarean section for placenta praevia. Intra-uterine death of foetus at 36 weeks. Pitocin drip for 8 hours failed to produce any contractions or dilatation. Seventy-two hours later developed marked tachycardia and became somewhat shocked. Laparotomy confirmed the diagnosis of rupture of the old scar. Satisfactory recovery after repair of uterus.

(2) Para-4, aged 27 years. All previous deliveries were normal. Intra-uterine death at 34 weeks. Pitocin drip for 8 hours failed to induce labour. Subsequently labour began spontaneously, but patient developed marked intra-uterine sepsis. Very poor contractions; no progress beyond 4-fingers dilatation. Difficult internal version and breech extraction. On exploration after delivery a rupture of the uterus extending into the left broad ligament was found. Hysterectomy was performed. Patient made a satisfactory recovery.

(3) Para-3, aged 29 years. All previous deliveries were normal. Premature rupture of the membranes at term. Forty-eight hours later given pitocin drip to induce labour. No response over the first 4 hours on the drip. One and a half hours later began bearing down with powerful contractions. The drip rate which previously had been 20 drops a minute now recorded at 50 drops a minute. Spontaneous delivery 10 minutes later of a male infant weighing 8 pounds 3 ounces (3,930 g.) in good condition. Fifteen minutes after delivery of the placenta lost 8 ounces of blood. A subsequent loss a few minutes later led to the exploration of the uterus. A rupture was found anteriorly in the lower segment. Treated by repair of the uterus with a satisfactory outcome.

The first case may perhaps have ruptured her uterus because of pitocin administration, although the drip produced no contractions and there was no evidence of shock or haemorrhage until some time later. Even so, it has not been

our policy to administer pitocin to any patient with a previously damaged uterus. The rupture in the second case may well be attributed to the difficult internal manipulations rather than to the previous use of pitocin. In the third case, however, there can be no doubt that the rupture was caused by pitocin. Presumably the uncontrolled acceleration in the rate of flow produced a series of powerful contractions. As Eastman (1958) comments, the regulation of the rate of flow of intravenous drip therapy is by no means infallible and oxytocin drips consequently require close supervision. In the present case, the sudden increase in the rate of flow was noted but not reported.

It will be apparent, however, that these were all multiparous patients. A search through the recent literature for reports of rupture of the uterus following oxytocin drip therapy discloses details of 5 cases (Ferguson *et al.*, 1952; Mauzy, 1954; Mathew, 1956; Hellman *et al.*, 1957). None of these was primiparous. The primiparous uterus responds to dystocia by hypertonus or inertia, but rarely ruptures unless traumatic manipulations are carried out. Thus while oxytocin may be given with reasonable safety to these patients, it should be used with caution in any multiparous patient. This view is supported by our considerable experience of oxytocin drips in patients with disproportion: among 130 primiparous patients with moderate and even major disproportion rupture of the uterus has not occurred.

Circulatory Effects. Pitocin is known to contain 5 to 7 per cent of a vasopressor principle and Greenhill (1956) has expressed anxiety about the danger of a sudden rise in blood pressure, particularly with pre-eclamptic toxaemia patients. Among the 300 patients a rise of 10 to 20 mm. Hg in either systolic or diastolic reading occurred in 41 cases (13·7 per cent) and a rise of more than 20 mm. Hg in 35 (11·7 per cent). Usually a definite rise in blood pressure only occurred with good contractions; those cases in whom contractions remained poor or improved only slightly did not experience much alteration in blood pressure.

One patient whose initial blood pressure was 120/80 showed a sudden rise to 150/90 after 3-hours administration of pitocin. One hour later she experienced a typical eclamptic fit at a blood pressure reading of 160/100. Treatment with hypotensives reduced the pressure to 130/90, and spontaneous delivery occurred 2 hours later. The eclampsia did not recur and mother and baby left hospital in good condition.

Thirty-nine patients were diagnosed as suffering from pre-eclamptic toxaemia; among them were 8 patients with severe toxaemia (blood pressure above 160/100, albuminuria not less than 1 gram per litre). The failure rate, incidence of asphyxia and foetal loss were no higher than for the series as a whole. Thirteen cases had a sufficient rise in blood pressure to warrant treatment with hypotensive drugs, but no untoward incident occurred. It was found necessary to discontinue the drip because of an alarming rise in blood pressure despite hypotensive therapy on only one occasion. This patient was having powerful contractions and delivered spontaneously 45 minutes later.

The pulse rate remained unchanged in the great majority of patients. In 19 (6·3 per cent) a rise of more than 20 beats per minute occurred; this was related once again to the onset of strong contractions.

Post-partum Haemorrhage. To guard against sudden haemorrhage from an atonic uterus the drip was kept running slowly until the end of the third stage in the majority of cases. Despite this a loss of 20 ounces or more occurred in 14 cases (4·7 per cent). A haemorrhage severe enough to cause shock occurred 3 times.

Other Complications. Hypertonus, i.e., a uterus remaining in a state of contraction for longer than 60 seconds, occurred in 8 patients. Slowing the drip or setting up a more dilute solution usually produced a subsidence of the hypertonic reaction but in 3 cases the drip had to be discontinued. There were 5 failures among these 8 cases. All babies were born alive, but in one instance the foetal heart dropped to 90 beats per minute. The drip was stopped, the foetal heart recovered rapidly and spontaneous delivery of a healthy infant took place one and a half hours later.

No toxic reactions to the pitocin, e.g., anaphylaxis, pituitary shock, occurred among the patients in this series.

Discussion

In most cases of inefficient uterine action, the setting up of an intravenous oxytocin drip leads to rapid dilatation of the cervix: almost two-thirds of the cases reach full dilatation in 6 hours, another 20 per cent in the following 6 hours. A slightly increased failure rate may occur with high station of the head, malpresentation and posterior position, but the drip may nonetheless be used safely and successfully in these conditions.

The drip is much more likely to fail if set up after cervical stasis has persisted beyond 10 hours or, although the figures in this regard are not conclusive, if labour has been prolonged beyond 30 hours. Further evidence for the earlier use of the drip comes from the observation that established sepsis has a most unfavourable prognosis for uterine action and there may be no response to even large doses of oxytocin. Obviously, the longer the labour the more likely is sepsis to develop.

All observers (Nixon, 1952; Ostry, 1955; Sturrock and Brown, 1956; Keettel and Pettis, 1956) agree that the foetal loss rises sharply once labour has lasted for 30 hours or more. If oxytocin is not to be used until the patient has laboured for this length of time there will be an inevitable foetal loss approaching 10 per cent—a loss which may well be attributed to the treatment and so bring it into disrepute. The asphyxia figures from the present series emphasize this point.

That oxytocin drips may be used successfully late in labour is not disputed. Nevertheless, there can be little doubt that they are best employed earlier: the success rate is higher, the danger of infection less, the risk to the foetus less. What remains to be determined is the optimum time for administration.

According to Friedman's (1955) experience with cervimetry, the latent phase of dilatation has a mean duration of 8·6 hours (mode 6 hours, median 7·5 hours, standard deviation 6 hours) with a statistical maximum of 20·6 hours. On this evidence the optimum time for administration would therefore seem to lie somewhere between 12 and 20 hours. As previously noted, however, there is often great difficulty in determining the exact duration of labour, and the method of using cervical stasis for longer than 6 hours as the main diagnostic criterion for inefficient uterine action appears a more satisfactory one.

In assessing the response to the drip, cervical dilatation should once again be the main criterion. Generally, progressive dilatation occurs together with good uterine action, but a surprising finding was that the two were not necessarily related. Unfortunately, mechanical methods of recording uterine action were not available, but a clinical assessment of the uterine response was made. As Table X shows, the failure rate was lowest in those patients who developed good contractions; even so, there were a considerable number of successes when there was no evidence of any definite change in the strength or the frequency of contractions.

Table X

Clinical Effect of Pitocin Drip on Uterine Action in Relation to Failure Rate

	Total No. of Cases	No. of Failures	Failures (Per cent)
No change in uterine action	54	9	16·7
Fair contractions ..	51	11	21·6
Good contractions ..	185	17	9·2
Irregular action ..	2	1	—
Hypertonic action ..	8	5	—

If oxytocin drips achieved their effects solely by restoring uterine action to normal then one would anticipate that contractions in the second stage would be sufficient to expel the foetus. Yet both in Theobald's (1956) series and in the present one, despite the high rate of success, the number of forceps deliveries was markedly increased. And most of these were mid-forceps deliveries, indicating that there had been little if any descent of the head. It is apparent that contractions in the second stage may remain poor, despite the rapid effect on dilatation. These observations underline the importance of using cervical dilatation rather than uterine action as the indication of effective response.

If after 6 hours of treatment the dilatation remains unchanged there is little purpose in

continuing the drip. Although our original practice was to set up the drip for 12 hours, more recently it has rarely been allowed to continue for longer than 6 hours—and only then if the cervical assessment at this time indicated that full dilatation could be anticipated within the following 2 or 3 hours.

The value of artificial rupture of the membranes is still unsettled. Occasionally, the procedure was followed by rapid dilatation after a period of oxytocin administration had produced no response, but no definite conclusions can be drawn from this small number of cases.

The most controversial observation in the present series concerns the use of oxytocin in inco-ordinate uterine action. But surely our knowledge of the physiology of labour is too incomplete and uncertain to accept the present classification of uterine action as more than a tentative clinical guide. Nor are the various categories distinct enough to allow confident grouping. Although 159 cases were labelled hypotonic, many suffered from painful contractions of varying intensity, often accompanied by persistent low backache, and while in the occasional case the uterus could be indented at the acme of a contraction this method of diagnosis did not prove infallible. The fact that almost a third of the cases could not be conveniently classified into either main group adds force to the argument.

Whatever the theory of uterine action, there can be little doubt that many cases which were classified as hypertonic responded well to the administration of oxytocin. In the present state of our knowledge (or ignorance), theoretical objections should not be allowed to influence proven clinical practice. On the evidence of Theobald *et al.* (1956), Kramer (1957) and the present series, inco-ordinate uterine action offers no contra-indication to the use of oxytocin. True, the best results will be obtained in the hypotonic type of uterine action. However, it is only in the rare cases of cervical rigidity that the failure rate is so high that the therapeutic validity of administering oxytocin may be doubted.

The over-riding importance of cervical assessment as compared with the type of uterine action may be further stressed by quoting an illustrative case:

> Primiparous patient, aged 19 years. Extended breech presentation. X-ray pelvimetry confirmed the clinical finding of a large pelvis. Labour commenced at term. Membranes ruptured after 8 hours of good, painful contractions. Dilatation: 3 fingers. Sedated with pethidine. At 10 hours of labour pulse rose to 120 beats per minute. No obvious cause was found. Dilatation at 12 hours: 3 fingers. Contractions strong and regular every 3 minutes, lasting 50 seconds; very painful and distressing. Sedation with morphine and scopolamine failed to effect much relief. At 16 hours of labour still 3-fingers dilated; maternal pulse 130 per minute. Pitocin drip (1:2,500) set up at 10 drops a minute. Fully dilated at 18½ hours. Assisted breech delivery at 19 hours. Baby alive and well, weight 6 pounds 7 ounces (3,090 g.). Maternal tachycardia settled spontaneously after delivery.

This illustrates the use of pitocin in a case of malpresentation with maternal distress where uterine action was certainly not hypotonic. Equally obviously, as the uterus relaxed well between contractions, the action could not be labelled hypertonic. In Table VI the case was classified as "generally inefficient", although others might well have included it in the inco-ordinate group. Sedation failed to achieve any progress and with the marked tachycardia the alternative to oxytocin would probably have been Caesarean section, although the patient was a young primigravida with an adequate pelvis. Presumably those who reserve oxytocin drips for purely hypotonic uterine action would have submitted her to operation.

Sometimes, for reasons which are not fully understood—although sensitization of the uterus by pitocin may play a part, as suggested by Theobald *et al.* (1956)—a repeat drip may succeed where the first has failed. The repeat drip need rarely be continued beyond 4 hours because dilatation usually proceeds rapidly within this period if the drip is going to succeed.

As regards supervision of the drip, both Theobald *et al.* (1956) and Ryan (1958) suggest that continuous medical observation is unnecessary, and Ryan so far decries the fears that have been expressed that he employs the drip continuously for as long as 40 hours without more than ordinary labour ward care. Experience derived from these 300 cases indicates that a hypertonic reaction may occur at any time during the

administration of oxytocin and, while continuous medical attendance has not been practised, there was at all times close observation. Even so, rupture of the uterus in the induction cases occurred once following a sudden, unreported acceleration in the rate of drip flow. Oxytocin drip therapy, in our view, is a hospital procedure requiring constant and unremitting care.

The great advantage which follows from the suggested procedure of one or two comparatively short periods of administration should need little emphasis. Prolonged administration is worrying to the doctor, uncomfortable to the patient, doubtfully effective, usually unwarranted and demands a degree of supervision which cannot normally be maintained.

The only valid contra-indication to oxytocin drip therapy lies in the potential danger of rupture of the uterus—a danger which, it would seem, threatens the multiparous patient far more than the primiparous one. Fortunately for the safety of the drip, most indications for its use, whether for inefficient uterine action or for the induction of labour, occur in primiparae. In all multiparous patients the drip should be most cautiously used, and it would be wiser to employ a dilution of 1 : 5,000 or even 1 : 10,000 to minimize the risks of sudden acceleration in the rate of flow. With these more dilute solutions a rate of flow of 40 drops per minute could be employed initially, as suggested by Theobald *et al.* (1956). No oxytocic agent should ever be employed in a suspect uterus.

The low perinatal loss for fresh stillbirths and neonatal deaths of 31 per thousand suggests that oxytocin drips add nothing to the foetal risk, even when foetal distress already exists. Indeed, by shortening labour, they may save some babies who might otherwise have succumbed. The only danger to the foetus lies in a hypertonic reaction, and this can be immediately relieved by slowing or stopping the drip.

The choice of oxytocic agent at present includes pitocin, syntocinon and valyl oxytocin (now under therapeutic trial in this department), and no doubt other preparations will become available in time. Theoretically, the synthetic agents should be free from any danger of anaphylaxis and the fact that they contain no vasopressor factor gives them an additional advantage over pitocin. In practice, the occasional marked rise in blood pressure which occurs with the pitocin drip appears to be more closely related to the strength of contractions than to the minute amounts of pressor substance entering the circulation, and may well have occurred if good contractions had developed spontaneously. The single case of eclampsia may be similarly explained. Nevertheless, as pitocin and syntocinon are indistinguishable in their effects on the uterus, it would be wiser, at least on theoretical grounds, to use the latter agent.

In conclusion, it is suggested that all primiparous patients with inefficient uterine action in the absence of disproportion should be submitted to a therapeutic trial of an oxytocin drip as follows:

(1) If the cervix has remained unchanged at 2-fingers dilatation or more for 6 hours—alternatively, if established labour has existed for 12 to 20 hours and half-dilatation has not been reached—an oxytocin drip should be set up.

(2) If no progress has been made in dilatation over 6 hours, the drip should be discontinued and sedation ordered.

(3) If no progress occurs over the following 6 to 10 hours a repeat drip may be set up.

(4) If no progress occurs after 4 hours, the repeat drip should be discontinued. The patient will by now have been in labour for 30 hours or more and Caesarean section should be seriously considered.

This therapeutic trial of oxytocin may seem somewhat radical, particularly after a relatively short period of labour. However, many procedures which are potentially dangerous have been made safer by better timing. Manual removal of the placenta, for example, was attended by a mortality of 7 to 10 per cent when practised as a desperate last resort; nowadays, when employed earlier in the third stage, we know it to be a relatively benign procedure.

It may indeed be apposite, as a final comment, to quote Ovid's dictum: *Temporis ars medicina fere est*—the art of medicine is generally a question of time. Surely this applies most

forcibly to the art of obstetrics, and more particularly to the diagnosis and treatment of inefficient uterine section.

Summary

Three hundred consecutive cases of inefficient uterine action, representing less than 2 per cent of the total number of deliveries over the same period, were treated by the intravenous oxytocin drip. Full dilatation within 12 hours was reached in 85·7 per cent of the cases. The perinatal loss, excluding those cases in which intra-uterine death of the foetus had taken place before starting the drip, was 31 per thousand. Caesarean sections were performed in only 3 per cent of the cases.

Analysis of the failures indicates that the duration of cervical stasis is the most important single feature determining a good response to the treatment. High heads, posterior positions, malpresentations and inco-ordinate uterine action offer no contra-indication to the successful and safe use of the drip.

The literature on rupture of the uterus associated with intravenous oxytocin drip therapy has been reviewed, and no case of rupture of the uterus occurring in a primiparous patient has been discovered. Three cases of rupture of the uterus associated with the use of pitocin for the induction of labour are reported. All of these were multiparous.

The only valid contra-indication to oxytocin drip therapy is the danger of rupture of the uterus in the multiparous patient. It is suggested that a more dilute solution should be employed in these cases and administration should be extremely cautious. Oxytocin should not be used in a suspect uterus.

Inefficient uterine action has been defined in terms of cervical stasis, and a plea is made for a therapeutic trial of oxytocin in all primiparous patients with cervical arrest at 2 or more fingers dilatation for longer than 6 hours.

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STAPHYLOCOCCAL SEPSIS IN A MATERNITY HOME AND DISTRICT

BY

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IN hospitals in many countries the emergence of the antibiotic resistant staphylococcus has perhaps caused more damage in the Maternity Department than in any other. The outbreak of sepsis described in this paper consisted mainly of breast abscesses of mothers and occurred in the Maternity Home of a country town of some 44,000 inhabitants. In this small community a more complete picture of events could be obtained than in a larger one where patients are scattered between different hospitals. Treatment and pathology of patients from both the Maternity Home and those delivered on District were carried out at the one general hospital. The outbreak was under review practically from its onset, as attention was drawn to the occurrence of sepsis by the simultaneous arrival in the Casualty Department of an infant a few weeks old with an axillary abscess, and of an unrelated mother with a breast abscess, from both of which a penicillin resistant staphylococcus was cultured. For nearly a year the bacteriology of the septic lesions and the carriers was followed. For six months efforts at controlling the spread were made, but finally the Home had to be temporarily closed, after which the outbreak was ended, although the pathogenic staphylococci re-appeared in carriers. A feature of the epidemic was a change of staphylococcal type after some weeks; phage type 80 replacing for a time that originally present—phage type *52/52A/80/42E/73+*. The passage of phage type 80 was followed from its first arrival in the nose of a member of the staff to infant carriers, and then to the septic lesions, until after some months it seemed to have lost much of its virulence and was causing little trouble.

A comparison was made between affected mothers and healthy controls, both as regards their general condition and their bacteriology. There was a follow-up of the former to trace any septic cross infection in their homes during the first year after delivery. A short review of district cases was carried out.

INVESTIGATION

Maternity Home. Methods. Material

The Maternity Home is an independent unit, satisfactorily designed and equipped, situated away from the main hospital and its staphylococci. There are just under 500 deliveries a year. Twenty-two patients are housed in two seven-bedded wards and in four smaller rooms. The infants are kept in a nursery, only joining their mothers at feeding time. The visiting staff consists of a gynaecologist, registrar, paediatrician and general practitioners. The home is a recognized Part II Midwifery Training School. For the purposes of this paper the Nursing Staff have been grouped as "Senior", i.e., Matron, five Sisters, four Staff Midwives, "Juniors", i.e., eight Pupil Midwives and Nursing Orderlies, and "Others", eight, mainly domestics, only two of whom enter the wards.

It was decided to take nasal swabs of infants and mothers just before they left the home, and of resident and visiting staff, and of all septic lesions. Some infants' umbilical, and staffs' skin swabs were also examined, as were

dust, bedding and clothing fluff. But as the pathology had to be within the compass of the small laboratory staff, identification of carriers had mainly to depend on the nasal swabs. The penicillin and terramycin sensitivity of coagulase positive staphylococci was examined as a routine, and other antibiotic sensitivities when time allowed. The results reported as "negative" included swabs which either grew no staphylococci, coagulase negative staphylococci or penicillin sensitive staphylococci. The last were included as "negative" as they caused no septic lesions. The phage typing was done at the Central Public Health Laboratory at Colindale.*

Two groups of healthy mothers were selected at random for a comparison as to general condition, confinement, breast treatment, incidence of nasal carriage and infant sepsis. One group, Controls I, was at the Home at the same time as the affected women, and the other, Controls II, had been there six months previously. Some multiparae were discarded from these controls in favour of more primiparae to make a fairer comparison, as there was a preponderance of breast abscesses in the latter. Of the 141 multiparae delivered 12 had breast abscesses incised, and of the 94 primiparae, 28.

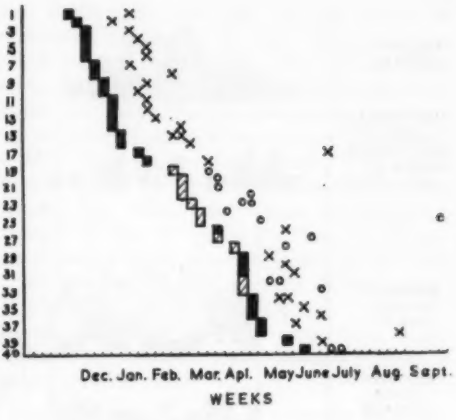

FIG. 1

SUMMARY OF EPIDEMIC

Forty-five women delivered between the end of November, 1955 and June, 1956, when the Home was closed, developed breast abscesses, i.e., over 19 per cent of the total deliveries. Five of these, treated very early with antibiotics, subsided. The dates of delivery and appearance of the abscesses and phage types responsible are shown in Figure 1. The time before the abscesses developed varied widely; 3 were over 16 weeks and the shortest time was 3 weeks. The average was 47 days if the 3 late ones are included, and 39 if these are omitted (cf. Sherman, 1956; Monro and Markham, 1958). Abscesses due to the two types of staphylococci had the same average development time. Six women had abscesses in both breasts; in one case the appearance of the second was delayed for twenty-one weeks. Many abscesses were recurrent and in some involved the whole breast. Those due to phage type 80 were particularly severe.

Table II shows other staphylococcal sepsis among the mothers. Two nurses developed septic fingers during the period of investigation. Only one case of cross infection in a patient's own home was serious enough for the patient to attend for treatment.

During the outbreak there were numerous cases of infant sepsis developing in the first few weeks of life, but fortunately none was serious and most were trivial (Fig. 2a).

After re-opening the Home, sepsis was reduced to the pre-epidemic level.

RESULTS UP TO CLOSURE OF THE HOME

BACTERIOLOGY

The bacteriological results from the staff will first be considered, and then those from the infants and the mothers.

* Phages 29,52,52A,79,80; 3A,3B,3C,55,71; 6,7,42E, 47,53,54,70,73,75,77; 42D were used.

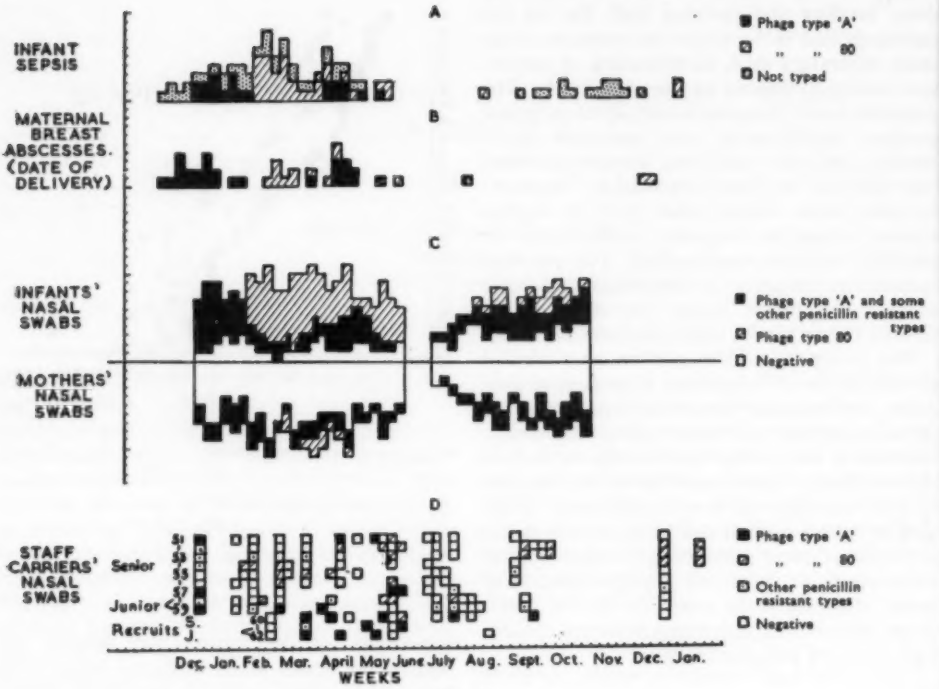

FIG. 2

(1) *Staff*

At the beginning of the investigation the following were found to be nasal carriers of penicillin resistant staphylococci: of the Visiting Staff, a Consultant and a General Practitioner; of the Nursing Staff, 13 out of 18 Seniors and Juniors, and one (a ward maid) of the Others. On phage typing the strains of three of these carriers, two seniors (Nos. 51 and 57) and one junior (No. 59) were found to be harbouring staphylococci of the same pattern as those then being cultured from the mothers' breast abscesses, i.e., *52/52A/80/42E/73+* (Fig. 2d). This staphylococcus, which could be typed only with strong phage filtrates, and had a somewhat variable pattern, will be referred to as "A", and was found to be sensitive to terramycin, chloromycetin, streptomycin and neomycin. It was decided to try to eliminate it from the nares by the local application to all the nursing staff of a terramycin ointment given over a fortnight. The three "A" carriers became negative, though they later relapsed after 6 to 19 weeks. It seems highly probable that this terramycin treatment was responsible for the appearance in a Sister (No. 54), at the end of the course, of a terramycin resistant staphylococcus, phage type 80, which was resistant also to penicillin, but sensitive to chloromycetin and neomycin.

Subsequently Nursing Staff, mainly Junior and Others left, some to join the District Staff, and were replaced by others whose nasal swabs were examined on arrival. Of this replacement staff 3 out of 27 were found to be carrying penicillin resistant staphylococci, but these all had a different phage pattern from "A" and 80. During their residence three previously negative

nursing recruits became "A" carriers (Nos. 60, 61 and 62), four to eleven weeks after their arrival. No other member of the Staff became an "A" carrier.

Two weeks after phage type 80 staphylococcus had been isolated from the Sister (No. 54) it began to appear in other members of the Staff, and during the epidemic was isolated from six other Seniors (Nos. 51, 52, 53, 55, 56, 60) and one Junior (No. 58). Nos. 51 and 60 had previously harboured "A", and No. 60 later reverted to "A".

After the treatment with terramycin cream, with its unfortunate result, several 3-weeks courses of nasal Graneodin were given. Most of the carriers were cleared, only to relapse later: indeed, phage type 80 staphylococci were isolated from three Sisters a year after the original outbreak (Fig. 2d).

At intervals skin swabs from hands were taken, but were found to give more negative results than the nasal swabs.

The only sepsis among Nurses, both already nasal carriers, one of type "A" the other type 80, were two septic fingers, the corresponding phage type staphylococcus being cultured from each lesion. The type "A" carrier left just after her finger had healed, to join the District Staff, and is mentioned later. The phage type 80 carrier was sent off duty and did not return till the finger was well healed and her nasal swab was negative.

No Nurse had received antibiotic treatment prior to the outbreak.

(2) *Infants and Mothers*

(a) *Carriers.* The infants were usually nasal carriers from their second or third day, and those swabbed throughout their stay in the Home were consistent in their type of staphylococcus. On discharge, as can be seen on Figure 2c, the large majority of them were carriers of penicillin resistant staphylococci, and for six weeks most of these were type "A". On the other hand their mothers were mainly unaffected, though an occasional "A" was isolated. There was then an abrupt change of phage type in the infants, the "A"s and other terramycin sensitive staphylococci were greatly reduced and type 80 predominated. The first of these was isolated seven days after its appearance in the Sister (No. 54) after her course of terramycin treatment. No type 80 carrier was found among the mothers for another four weeks, and even then they were never numerous, the majority of the mothers remaining free from any penicillin resistant staphylococci. At the end of May it looked as though the "A" staphylococci would re-establish themselves in the infants, but there was again an alarming increase of type 80 up to the time the Home was closed. During these 24 weeks 84 per cent of the infants were found to be nasal carriers of penicillin resistant staphylococci.

Umbilical swabs were also taken from many of the infants, and the results closely paralleled those from the nares.

(b) *Infant Sepsis.* In the six months from the mid-December, 1955 to mid-June, 1956, 92 cases of infant sepsis were reported during the first few weeks of life. None was serious and most were trivial—a few skin spots, some of which did not come to a head. The more serious lesions appeared just after leaving the Home. An analysis is given below:

Pustules and spots	63	Abscesses	2
Boils	7	Septic digits	8
Mastitis:		Conjunctivitis	8
non-suppurative	1	Aural discharge	1
Styes	1		

The lesions are shown on Figure 2a, and there is a peak with the appearance of phage type 80 staphylococci. Some of the small pustules were not typed, but the ones that were agreed closely with the general pattern.

A comparison was made with the Controls I; 20 lesions were found in babies whose mothers developed breast abscesses, and 18 in the Controls. The more serious lesions appeared in both groups. As against this close agreement there is a marked contrast in the other control group (II) from the previous year; of these 40 mothers, 4 only of their infants were reported with sepsis, again mainly mild, though an abscess needed incision.

(c) *Maternal Breast Abscesses.* The dates of delivery of the mothers with breast abscesses and their staphylococcal type are shown in Figure 2b, with the results of the nasal cultures. After 18 abscesses due to staphylococcus "A",

TABLE I

		Infants' Nasal Cultures				Total
		"A"	80	Negative	Early Cases not Typed	
From breast abscess cases ..	"A"	18 (3+80)	3	2	5	28 } 40
	80	2	10	0	0	12 }
From Controls I		18 (1+80)	10	7	5	40

		Mothers' Nasal Cultures				Total
		"A"	80	Negative	Early Cases not Typed	
From breast abscess cases ..	"A"	4	0	19	5	28 } 40
	80	0	2	10	0	12 }
From Controls I		6	1	28	5	40

there was a change of type to 80, the next 8 abscesses during six weeks being of this type. Later there were another 4. The first of these mothers was delivered ten days after type 80 had been isolated from an infant's nose. Table I shows the results of nasal cultures of patients and controls and their infants.

As will be seen, the same type of staphylococcus isolated from the breast abscess ha except on a few occasions also been culture from the infant's nose when it left the Hom (or in earlier cases, when the abscess wa incised), but not from the mother's nose. Whe the mother was a carrier, the infant also carrie

TABLE II

Lesion	Phage Type	Phage Type			
		Subsequent Breast Abscess	Mother's Nose	Infant's Nose	Infant Sepsis
Boil on breast	"A"	—	Negative	"A"	—
Boil on breast	"A"	—	Negative	"A"	—
Cyst on breast	"A"	"A" (3 weeks later)	Negative	"A"	—
Multiple boils	"A"	—	Negative	"A"	—
Vaginal discharge	"A"	"A" (3 weeks later)	Negative	"A" and 80	Pustule 80
Boil on breast	80	80 (5 weeks later)	Negative	80	—
Mastitis: Milk (non-suppurative)	80	80 (4 weeks later)	Negative	"A" and 80	Septic finger "A
Carbuncle, shoulder	80	—	80	80	—
Septic hand	80	—	Negative	80	—

the same type. When the infant carried two staphylococcal phage types, either type occurred in the mother's breast abscess. Controls (I) gave a very similar picture, except that 7 infants gave negative results.

(d) *Other Maternal Sepsis.* Maternal sepsis other than breast abscesses occurred either when the patient was in the Home or shortly after leaving it, and this is listed above with the phage types of the staphylococci cultured (Table II) from the lesions and nares.

In each case the same type of staphylococcus was obtained from the lesion and the infant's nose, but only once from the mother's nose. Four of these 9 women developed breast abscesses later. From the 2 infants who carried both types, mother and child were affected by different staphylococci.

Both types of staphylococci were cultured in limited numbers from dust, bedding, etc.

Clinical Condition of Patients and Controls

The condition of patients when they left the Home could be judged in retrospect from an examination of their notes, and this was compared with that of the two groups of controls. Blood loss, abnormalities during delivery, breast feeding, treatment of the breast and haemoglobin on discharge were included, and are shown in Table III.

The patients had a slightly greater average blood loss, but this was made up before leaving the Home; obstetric abnormalities were a very little more frequent, as were cracked nipples. One mother developed an abscess though the infant had never been to the breast (Knott and Blaikley, 1944; Sherman, 1956).

Management of the Epidemic

Nursing methods and conditions at the Home were scrutinized, and were found satisfactory, and had been in no way modified shortly before the epidemic. Some additional precautions were introduced. Every effort was made to reduce dust. Floors were kept washed, curtains removed, boilable flannelette shawls replaced the infants' woollen ones, and all blankets were laundered with the Cirrasol-Lissapol (Blowers and Wallace, 1955) treatment, and this has continued since. The local treatment of the Staff noses has been described, and varied between temporary success with Graneodin, and a highly unfortunate result with terramycin cream. The Staff used Hibitane hand cream, and Hexachlorophene soap was supplied for hand and hair washing. After some hesitation, masks were ordered to be worn while handling infants, but later were considered to be of such doubtful use that they were discarded. The Nursery was fumigated by the use of Sanitas Formigator Tablets. Rooming-in was initiated in the smaller wards, but was impracticable in the larger ones, but the infants were handled by the nurses as little as possible, and bathing almost eliminated. The umbilical cord was kept covered with sterile gauze, and any infant with sepsis was isolated and barrier nursed. Breast handling of the mothers by the nurses was reduced, and shortly before closing the Home the nipples were treated regularly with Massé cream, which is stated to have bacteriostatic

Table III

	40 Breast Abscess Mothers	40 Controls (1)	40 Controls (2)
Average blood loss (ounces)	13·8	12·6	10·9
Transfusion ante-partum	1	1	1
Transfusion post-partum	3	2	1
Forceps	3	0	0
Breast feeding	39	36	38
Cracked nipple	4	1	1
Expressed breast	23	24	28
Average haemoglobin on leaving Home (g. per 100 ml.)	10·8	10·8	11·0

constituents. There was a strong feeling against the use of antibiotics as a prophylactic measure, applied either locally or systemically, to the infants or the Staff, after the first misadventure with terramycin cream. Limited Staff precluded carrier nurses being sent off duty.

The long and varying time between the date of delivery and the appearance of a breast abscess makes the decision of when a Maternity Home will have to be closed a difficult one. In June there was an alarming increase of type 80 staphylococci in the infants' nasal swabs, and a recurrence of these carriers in the Staff: also the number of mothers with breast abscesses attending Casualty for surgical intervention and prolonged treatment was causing widespread concern. It was essential that the Home should be closed. Actually, during six weeks of May and June before the closure of the Home, only two mothers were delivered who later developed breast abscesses. The epidemic may have been ending.

Closure of Home

The mothers and infants were discharged as early as possible, and no more admitted for nearly three weeks. Except for one member of the Senior nursing staff who had never been found to be a staphylococcal carrier, all the Staff were dispersed to their homes, and instructed to apply Graneodin ointment. After a fortnight they returned to the laboratory for swabbing, and were not re-admitted to the Home until three consecutive negatives during a week had been obtained. Persistent penicillin resistant staphylococcus carriers were allowed back if their phage type differed from "A" and 80. Indeed, it would have been impossible to staff the Home if they had not been.

Meanwhile there was a thorough cleaning and fumigation of the Home, including the nurses' quarters. The Wards, Nursery and passages were redecorated. All bedding and uniforms were sterilized.

Results After Re-opening the Home

After the Home was re-opened no type "A" or 80 staphylococci were isolated for nearly three weeks, then one Staff carrier of each phage type was found (Nos. 60, 58). "A" appeared two, and 80, three weeks later, in 2 infants. The mother of the former developed an "A" phage type breast abscess. Thereafter both types were consistently found in a few infants, and type 80 in the 3 Sisters until December, 1956, when, as no more abscesses had developed, regular swabbing ceased. During these eighteen weeks, 57 per cent of the infants were found to be carrying penicillin resistant staphylococci. The staphylococci were not recovered from blankets, etc. In the first six months of 1957, 4 women were delivered who later had breast abscesses, and in the last six months, one. The figure of 5 in that year was back to the 1955 level (Table IV). Type 80 staphylococci were isolated from all cases, in one, both breasts were involved.

Table IV
Breast Abscesses Opened

	Maternity Home	District	Other Parts
1955 ..	5	1	0
1956 ..	41	4	0
1957 ..	5	9	5
	(Also 1 infant, 1 man, 1 adolescent girl)		(4 from hospitals)

Infant sepsis was greatly reduced; 15 minor lesions occurring in the last half of 1956, and 28 in 1957. Only one of these was severe—a breast abscess in the baby whose mother had bilateral breast abscesses. The infant's abscess preceded the mother's by 10 days.

Septic Cross-infection in Patients' Homes

Only one such case attended for treatment. A 2-year old sibling developed a septic finger from a phage type "A" staphylococcus, which type had been cultured from the mother's breast abscess and the infant's nose. To discover if there had been much other minor sepsis, visits were made to the homes of 35 women who had had breast abscesses, 10 of these being phage type 80. At the end of a year none of the other siblings in the families—sixteen—had been affected, nor had the sixteen grandparents living at home.

One husband had had a septic finger and one boils on his chest. At the same time enquiries were made concerning any further sepsis of the mothers and infants. Two of the mothers had had a few boils and two infants some small pustules. Of course it is not known if any of these lesions except the first, who had attended for treatment, were caused by either of the epidemic staphylococci.

District Cases

About 300 women a year are delivered on District by a Staff not living in the Maternity Home. In 1955 one breast abscess had been opened (Table IV). Four abscesses occurred in 1956, one of these had been attended by a nurse who had very recently left the Maternity Home, and whose septic finger—type "A"—had only just healed. The abscess not surprisingly was also of this type. In 1957 the District cases of breast abscesses had risen to 9, and there were also 5 in women who had been delivered away from the town. Five of the District-delivered breast abscess cases, attending about the same time, had the phage pattern *7/(52A/79)*. This type had never been isolated from the Maternity Home. It suggests that there must have been a carrier amongst the District Staff, but unfortunately no investigation could be arranged. One 13-year old girl and one man also attended with breast abscesses: these had had no contact with maternity cases.

Discussion

The general pattern of this outbreak conforms to those previously described in the following particulars: (1) Primiparae were particularly susceptible to breast abscesses (Fulton, 1945; Geschickter, 1945); (2) at the commencement there was a high carrier rate of penicillin resistant staphylococci in the Staff (mainly Senior Nursing) and the infants, whereas few mothers were affected (Barber *et al.*, 1953; Barber and Burston, 1955; Hurst, 1957); (3) infant sepsis was markedly increased, though on this occasion with minor lesions (Fulton, 1945; Colbeck, 1949; McGuinness and Musgrove, 1949; Webb, 1954; Sherman, 1956).

The permanent eradication of the two epidemic staphylococci from the carrier nurses proved impossible by the topical application of Graneodin. It is uncertain whether the general methods of control, the temporary closure of the Home, or loss of virulence of the staphylococci ended the epidemic. Both infant and maternal sepsis had lessened in the last few weeks before closure, in spite of the very high carrier rate in infants and Staff. After re-opening the carrier rate of penicillin resistant staphylococci was never as high as before (a drop from 84 per cent to 57 per cent in the infants) and though "A" and 80 were both identified, sepsis fell to a pre-epidemic level. A loss of virulence in the staphylococci seems the most likely explanation, possibly caused by prolonged habitation in the carrier Staff (Barber and Burston, 1955), and frequent assaults by Graneodin.

It seems highly probable that the appearance of the terramycin resistant phage type 80 staphylococcus was caused by the use of the terramycin cream, the dangers of which were not then realized. The Sister first affected (No. 54) had previously carried a staphylococcus resembling type "A", except that it had a stronger reaction with phage 80; it is interesting to speculate whether the typical type-80 strain arose by modification of the type "A" strain in this Sister. The passage of phage type 80 staphylococcus from Staff to infant carriers (7 days) to septic lesions (infant sepsis, 10 days) was very clearly defined, though of course with this investigation no light was shed on the actual mechanism of the spread.

The competition between "A" and 80 for possession of the infants' nares is of considerable interest. For some weeks "A" was almost entirely displaced, but then returned in force, ultimately causing infant and maternal sepsis. This return followed the appearance of fresh "A" carriers among the new nursing arrivals (Nos. 60, 61, 62) (Fig. 2d), and perhaps this accounts for its increased virulence. Type 80 finally reasserted itself, and this coincided with an increase of Staff carriers of this type.

It was hoped that by comparison with normals some light would be thrown on which women were susceptible to breast abscesses, and that this would lead to effective precautionary

measures. There was however a close agreement between the affected women and the Controls I and II, as far as their clinical condition, obstetric adventures and breasts were concerned. Moreover, general personal hygiene and social class was not a factor. The infants of Controls (II) had very little sepsis, but those of Controls (I) had almost as much as those of the patients, 18 against 20. Five fewer infant nasal carriers were found in Controls (I) than in those of the patients, a small difference, and the epidemic staphylococci must have been introduced both from infant sepsis and nasal carriers into almost as many homes with no ill results as into those where breast abscesses developed.

Even if all sepsis apart from breast abscesses developing in the patients' homes is taken to be true cross-infection and not incidental, the cases were very few and mild, even in highly insanitary homes with abscesses draining pus for weeks. Many of the breasts must have been infected weeks after leaving the Home; evidently the staphylococci had lost none of their virulence for their site of election, but once away from the Home they caused negligible damage to infants, siblings and adults, but this fortunate event may well be unusual in such epidemics.

The general increase in the country of breast abscesses was reflected in the number opened in the main Hospital. Women delivered in their own homes are now not so immune as they have been. Pathogenic staphylococci may be carried to them by nurses who have acquired them in hospitals, e.g., the case here described. Without a pool of infant carriers, infected blankets, etc., a formidable epidemic appears extremely unlikely, but the increase in the general population of penicillin resistant staphylococci puts more people at risk as some of these staphylococci have a predilection for the breast. The male and the child patients had had no connexion with any hospital contacts. Five cases on District were caused by staphylococcus *7/(52A/79)*, one that had never been found in the Maternity Home, and one must suppose that it was spread by one of the District Staff, unaided by a background infection of dust and infants' nares.

Since this outbreak conferences have been held in this country (Williams and Shorter, 1957) and in America (American Medical Association, 1958) on staphylococcal infections and their control. Also detailed studies are being made on the route of spread of the organisms (Cook, Parrish and Shooter, 1958; Forfar and Maccabe, 1958) and their distribution from carriers (Hare and Ridley, 1958). No summary will be attempted here of the methods of control recommended, which are aimed at an improvement of general hygiene and sterilization, the reduction of contact between the infant and the person and clothing of the Staff, the adequate treatment of the umbilical cord and the clearing of carriers. In the smaller and less modern units, with limited nursing staff, some suggestions would be impracticable. A chart of infant sepsis, however mild, is important, as a rise may herald the advent of a serious outbreak, and at this stage the type of organism and its sensitivities to antibiotics should be determined, so that early treatment could be given, and incision of abscesses possibly avoided.

With the long interval after the time of delivery until the abscess develops a Maternity Department can only shut when an epidemic is under way. But closure should be considered as soon as the fact of an epidemic is established. Though it may appear a small one approximately another four weeks patients have already been exposed to infection. While the staphylococcus continues to be in the ascendant, District Midwifery should be encouraged, and in-patients should be discharged as early as possible.

Summary

(1) An outbreak of sepsis in a Maternity Home and its bacteriology has been described.

(2) The appearance of *Staph. aureus* phage type 80 was noted during the epidemic and its spread was followed.

(3) A clinical and bacteriological comparison was made between patients and normal mothers and their infants.

(4) Cross-infection in patients' homes was investigated.

(5) An increase of breast abscesses in home confinements was described.

ADDENDUM (December, 1958)

Of the three Sisters who were persistent nasal carriers of phage type 80 staphylococci, No. 54 is no longer a carrier, No. 52 has left the district, and No. 53 still carries the same staphylococci 2½ years after the epidemic had ended. No other type 80 carrier is now found in the other Staff or in the infants, and no septic lesions have been caused by this type. The staphylococcus appears to have lost its virulence and colonizing power.

My thanks are due to Dr. R. E. O. Williams for his advice, and to the Staphylococcal Reference Laboratory at Colindale where the phage typing was done.

I also wish to thank the Matron and Staff of the Maternity Home who co-operated most whole-heartedly during the epidemic.

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THE HYDROCORTISONE PRODUCTION IN LATE PREGNANCY

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THAT the adrenal cortex is stimulated to progressively greater activity during the course of pregnancy is now generally accepted. As long ago as 1946 Venning measured, by a bioassay method involving glycogen deposition, the amount of free cortical hormone appearing in the urine and found this to be increased in pregnancy.

Since that time the excretion in urine of a variety of adrenal cortical metabolites has been measured and most of these have shown increases in pregnancy though they differ very widely in degree (Table I). But although these findings justify the conclusion that adrenal cortical activity is probably raised in pregnancy (Jailer and Longson, 1957), the magnitude of this increase has remained a matter of conjecture, since methods were not until recently available for measuring the actual production rate of adrenal cortical hormones in man, and as a

TABLE I

Increases in Adrenal Metabolites in Late Pregnancy

Metabolite Group	Reference	Per cent Rise Over Non-pregnant
Free hormone (bioassay)	Venning (1946)	200 to 400
Formaldehydogenic steroids	Tobian (1949)	100
Reducing steroids	Devis (1954)	160
	Parviainen, Soiva and Vartiainen (1950)	100
17-ketosteroids	Venning (1946)	100
	Huis in't Veld, L. G. (1954)	40
	Schuller (1957)	50
	Martin and Mills (1958)	20
	Birke, Gemzell, Plantin and Robbe (1958)	100
	Cope and Black (1959)	100
17-hydroxycorticosteroids	Appleby and Norymberski (1957)	40
21-deoxyketols	Appleby and Norymberski (1957)	700
17-ketogenic steroids	Norymberski and Stubbs (1956)	40
	Schuller (1957)	30
	Martin and Mills (1958)	38
	Cope and Black (1959)	40
Plasma 17-hydroxycorticoids	Gemzell (1953)	200 to 300
	Bayliss *et al.* (1955)	150
	Christy, Wallace and Jailer (1955)	120
	Robinson *et al.* (1955)	200
	Birke, Gemzell, Plantin and Robbe (1958)	250
	Martin and Mills (1958)	50

result the relation between such production and the amount of the various metabolites appearing in the urine was not adequately known. The present uncertainty over the interpretation of these excretion data is well illustrated by the views of Appleby and Norymberski (1957) who considered that "the urinary excretion of the main metabolites of cortisol is essentially unchanged" so that "it would follow that it is not necessary to postulate an increased activity of the adrenal cortex in pregnancy in order to account for the high plasma levels of cortisol". Migeon, Bertrand and Wall (1957) have also concluded, on the basis of their experiments that "it would appear that there is no real increase in the production of adrenocortical steroids in pregnancy".

Recently, however, samples of the adrenal cortical hormones, including hydrocortisone, have been prepared which are labelled with radioactive carbon, ^{14}C. By the appropriate use of such radioactive steroids it now becomes possible to determine the actual daily production of hydrocortisone in the human subject with an accuracy sufficient for most clinical purposes. Two methods are available. Using the first, Peterson and Wyngaarden (1956) have injected radioactive hydrocortisone into human subjects and, by measuring the rate of dilution of this in the blood stream with non-radioactive hydrocortisone produced by the patient's own adrenal, they have been able to calculate the rate of formation of this endogenous hydrocortisone. Cope and Black (1958a) have developed an alternative and rather simpler method making use of the principle of isotope dilution, and with it they have measured the hydrocortisone production rate in a variety of clinical states in man. The present paper reports the results of using the method of Cope and Black to measure hydrocortisone in the last month of normal pregnancy. It shows that at this time hydrocortisone production is from 2 to 2½ times the resting non-pregnant level.

Methods

The method employed to determine hydrocortisone production rate has been described in detail by Cope and Black (1958a). In this method a very small dose, about 40 micrograms, of radioactive hydrocortisone is given to the patient by mouth. This is rapidly absorbed from the stomach into the tissues and there mixes with the general body pool of hydrocortisone. The metabolic breakdown products of this pool are then excreted fairly completely during the next 24 to 48 hours in the urine and the efficiency of the elimination in the individual subject can be readily determined by measurement of the ^{14}C in this urine. The radioactive hydrocortisone will be distributed evenly through the endogenous hydrocortisone and will enter equally into all the urinary metabolites. If then the ^{14}C content of any one of these metabolites be determined, the total mass of adrenal metabolites of known and unknown composition can be simply calculated. For if S_u be the ^{14}C content per microgram of a representative metabolite and C_u be the ^{14}C content of the whole urine then the total mass of metabolites will be C_u/S_u micrograms since all the metabolites will be similarly labelled and there is no other source of ^{14}C. From the calculated mass of metabolites thus obtained, together with the observed efficiency of excretion in the urine of these metabolites, the daily production rate of hydrocortisone can be directly calculated. In practice when the test dose is given by mouth 100 per cent absorption from the stomach cannot be assumed with certainty, but absorption must have been at least as great as the observed percentage of the ^{14}C dose in the subsequent 24-hour urine. Calculations of the hydrocortisone production rate by this method are thus subject to an ambiguity. As a result two estimates must be arrived at between which the true figure will lie, these estimates assuming on the one hand complete gastric absorption and incomplete urinary excretion, and on the other incomplete gastric absorption with complete efficiency of metabolic excretion in the urine. Usually these two estimates are fairly close together.

The method is dependent on the separation from the urine of a suitable metabolite in a sufficient degree of purity. The most convenient metabolite for this purpose is tetrahydrocortisone which is present in the urine in adequate amount and can be separated by paper chromatography. This compound is a direct

decomposition product of hydrocortisone and is not likely to be derived from any other source.

Eight women in the last month of pregnancy have been studied by this method and have been compared with eight women of comparable age who were not pregnant and who were not suffering from conditions likely to influence adrenal activity.

The dose of radioactive hydrocortisone administered to each subject in this study was about 0·25 microcurie. From 70 to 90 per cent of this is eliminated in the urine during the next 24 hours and further small amounts appear on succeeding days. There is evidence that the administered steroid crosses the placental barrier rapidly into the foetal circulation, but elimination of the steroid from the foetus occurs with equal facility. Migeon, Bertrand and Wall (1957) found that when a dose of ^{14}C-hydrocortisone four times greater than was used here was administered 24 to 48 hours before delivery, no radioactivity was measurable in either maternal or cord blood at delivery time. Furthermore these workers found that when small doses of radioactive hydrocortisone were injected directly into two newborn infants of 15 and 20 hours age the efficiency of excretion of the radioactivity was as good as in adult subjects. Thus the radiation exposure to both mother and foetus resulting from these tests is of low intensity and of short duration. It has been estimated on the basis of a biological half life of 10 hours at 0·006 mRad. This corresponds to the radiation dose received by each member of the population from natural sources in about half an hour. All subjects were made aware of the nature of the tests and underwent them voluntarily. Permission was given by the M.R.C. Clinical Isotopes Advisory Panel for these tests to be carried out and in no case did the quantity of isotope administered exceed one-third of the maximum permitted by this Panel which was one microcurie.

Results

The results are shown in Table II. The estimate of hydrocortisone production is here

TABLE II

Hydrocortisone Production in Pregnant and Non-Pregnant Females

	Hydrocortisone Production mg. Daily	17-ketosteroids mg. Day	17-ketogenic Steroids mg. Day
(a) *Late Pregnancy:*			
Ma. between	25·3 and 26·8	13·4	5·6
Gr. between	28·5 and 40·2	15·0	7·4
O'D. between	19·7 and 28·1	13·4	12·2
McH. between	19·1 and 20·6	11·6	13·6
K. between	15·0 and 20·3	16·8	16·1
Je. between	23·1 and 24·9	14·0	12·5
Ly. between	30·7 and 36·6	15·0	22·8
Jo. between	18·7 and 24·9	13·3	10·0
Mean	22·5 to 27·8	14·1	12·5
(b) *Non-pregnant Women of Similar Age:*			
Pr. between	17·2 and 23·6	7·6	10·2
Th. between	6·4 and 8·0	4·0	5·5
De. between	10·3 and 14·5	5·4	3·2
We. between	5·7 and 7·9	7·7	8·4
Ke. between	8·7 and 10·9	10·0	17·0
Da. between	7·8 and 8·1	4·0	4·9
La. between	6·7 and 8·1	5·9	6·7
Lo. between	18·3 and 18·5	13·7	15·0
Mean	10·1 to 11·3	7·3	8·9

expressed as a range between two figures as stated above, this range being dependent on the uncertainty over the completeness of absorption of the dose from the stomach. In most cases the range of uncertainty is small and a fairly reliable estimate can therefore be made. Some scatter is apparent in the results, and is to be expected. The lower estimates range from 15 to 30·7 mg. daily, with a mean of 22·5 mg. and the upper estimates vary from 20·3 to 40·2 mg. with a mean of 27·8 mg. daily. In contrast to these figures the comparable non-pregnant group shows a range for the lower estimates between 5·7 and 18·3 mg. with a mean of 10·1 mg., and for the upper estimates between 7·9 and 23·6 mg., with a mean of 11·3 mg. Thus the hydrocortisone production during late pregnancy tends to be twice to 2½ times the non-pregnant figure, though there is considerable scatter in both groups and some overlap between the two.

In the Table are recorded also the 17-ketosteroids and the 17-ketogenic steroids in the two groups. For 17-ketosteroids the mean value in pregnancy is 14·1 mg. compared with 7·3 mg. for the non-pregnant. For the ketogenic steroids the mean is 12·5 mg. compared with a mean in the non-pregnant group of 8·9 mg.

Discussion

These results thus afford confirmation of the impression gained from earlier less definitive assays, that an increase occurs in the activity of the adrenal cortex in pregnancy, and show this to be a 2 to 2½ times rise. They also establish the actual magnitude of the hydrocortisone production in late pregnancy as between 20 and 40 mg. daily. These hydrocortisone production rates may be compared with figures obtained under other conditions. Cope and Black (1958b) studied 16 resting convalescent males and obtained mean figures between 12 and 14 mg. daily. The mean figure of 11·3 mg. for the non-pregnant females thus maintains about the usual ratio between the sexes. With corticotrophin stimulation much greater outputs may be achieved, figures in excess of 200 mg. daily being readily possible. Active medical disease increases hydrocortisone production by about 50 per cent, but the increases are rather less than those seen in late pregnancy. Figures similar to those in pregnancy are however encountered in severe hyperthyroidism where a mean of 25 mg. has been observed (Cope and Black, 1958b).

The results show clearly that the rise in plasma hydrocortisone which is recognized to occur in pregnancy is due largely to increased production rather than to decreased utilization or destruction. Since the magnitude of the increase in plasma hydrocortisone is about the same as the increase in hydrocortisone production observed here, it seems possible that the latter is the sole cause of the plasma rise. But recently Migeon, Bertrand and Wall (1957) have shown that the half-life of radioactive hydrocortisone administered to women in late pregnancy is about twice that found in non-pregnant women. They conclude from this that there is a decreased metabolism of hydrocortisone, rather than an increased production. The half-life however is dependent on the pool size as well as the rate of metabolism and this is presumably much increased in pregnancy, so that deductions of production rate cannot safely be made from the data they have presented.

Although it is reasonably certain that the greater part of this hydrocortisone is produced in the adrenal cortex, the possibility that a small part is formed in the placenta cannot be completely excluded.

It is of interest to note how well the figures for hydrocortisone production recorded here agree with the purely clinical estimates based on the optimum requirements for pregnant subjects with Addison's disease. Such pregnancies have been successfully brought to full term on doses of cortisone acetate varying from 10 (Hunt and McConahey, 1953) to 50 mg. of cortisone acetate daily. Kaiser (1956) successfully treated a patient, proved later to have no functioning adrenal cortex, on doses of 12·5 mg. daily only. Francis and Forster (1958) have recently reported two cases treated throughout pregnancy with 25 mg. daily of cortisone acetate. Hunt and McConahey (1953) report a case treated with 37·5 mg. daily and Nabarro (1958) has also brought a case to term on the same dose. The patient of Beckett and Evans (1957) who was

able to choose her own dose of cortisone during pregnancy developed clear signs of over-dosage on 50 mg. daily and had to have this dose reduced to 37·5 mg. Clinical experience therefore is in good agreement with the biochemical findings.

The very wide variation in the rises of different types of adrenal steroid metabolites revealed in Table I, which are representative but by no means exhaustive, shows well the great difficulty in drawing conclusions from such measurements as to the actual changes in hydrocortisone production by the adrenal. They account for the great ambiguity which has existed over the magnitude of the increase of adrenal activity in pregnancy. It should not be assumed that those metabolites which show in Table I a 100 to 150 per cent increase, such for instance as the 17-ketosteroids, are necessarily good indices of the changes in adrenal activity. With such a wide range of variation among the different assays, such agreement may easily be fortuitous.

Summary

The daily production of hydrocortisone from the adrenal cortex has been measured by a method employing radioactive hydrocortisone.

Eight subjects in the last month of normal pregnancy have been compared with eight non-pregnant women of similar age range.

Hydrocortisone production in late pregnancy ranges between 20 and 40 mg. daily with a mean of about 25 mg. The production in non-pregnant women ranges between 5 and 23 mg. with a mean of 11 mg. daily.

The hydrocortisone production in late pregnancy is increased to from 2 to 2½ times the non-pregnant figure.

Acknowledgments

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ANOTHER CASE OF QUADRUPLETS

BY

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MULTIPLE births, like all natural curiosities, have excited Man's interest since very early times, and twins especially, being fairly common, have had more than their fair share of attention, to which fact Castor and Pollux, Romulus and Remus, the writings of Pliny and the many Biblical references bear eloquent testimony.

The first specific reference to quadruplets, however, would seem to be that of Hagendorn. Writing in 1685 he describes a case occurring in 1681, but two of the children "several hours after baptism bade the world farewell". Schroeckius (1698), in the same book, quotes a case which happened two years later and shows a picture of the babies which look however to modern eyes suspiciously postmature. Schuster (1741) published a long account of a case of quadruplets with a comment upon the possible cause and the hazards of delivery, and Hermann mentions an apocryphal Russian peasant woman of the eighteenth century whose fifty-three children included four sets of quadruplets.

By the nineteenth century the condition had come to be regarded as fairly common, although, as all four children rarely, if ever, survived, most accounts give little information on the sex of the infants or the state of the placenta. By 1916 a case of surviving quadruplet girls was reported in America by Pendergraft and in 1920 another was published by Pinard in France, the babies having been born in 1915.

The first surviving British quadruplets were born at Eynesbury, Huntingdonshire, in 1935 and although this event came as rather an anti-climax to the Dionne quintuplets of one year earlier, the St. Neots babies, as they came to be known, nevertheless formed the basis of the British quadruplet tradition, which now consists of some five families.

PRESENT CASE

Mrs. M.M.B., aged 37 years, first reported on 18th June, 1957, because of amenorrhoea since 16th April. She had previously given birth to a boy in January, 1947 and to twins, a boy and a girl, in August, 1951.

Her abdomen was always larger than was to be expected for the period of amenorrhoea and on 9th September, 1957, three heads could be palpated. X-ray at this time showed three heads but four spines, and the patient was admitted to hospital. An extremely placid woman, she was quite content to stay in bed for the remainder of her pregnancy, being allowed up for toilet only. An X-ray on 10th October confirmed the presence of quadruplets (Fig. 1) and an electrocardiograph on 29th November

showed three separate tracings (Fig. 2): an assurance was given by the cardiologist, however, that this did not mean that the fourth baby was not alive. During the whole prenatal period the patient's blood pressure remained below 120/80 mm. Hg, her urine was free of albumin and there was no oedema.

By mid-December the patient showed no signs of labour and it was decided to perform a Caesarean operation for the following reasons:

(*a*) She was 37 years old.

(*b*) She was nearly at full-term and there was gross overstretching of the uterus.

(*c*) The first baby was a transverse lie.

Operation

Caesarean section was carried out (B.G.S.) on 14th December, 1957, using the straightforward lower segment technique. The four babies were delivered in less than two minutes and each was carefully identified against the placental stump of its umbilical cord and given a symbol for later recognition. A sample of cord blood was taken from each child and similarly labelled.

After delivery of the infants the placenta, which had been attached to the posterior uterine wall and was therefore complete, was allowed to separate spontaneously before removal and the uterus and the abdomen were closed. Two ml. of ergometrine were given intravenously just before the end of the operation, which had proceeded uneventfully and taken 25 minutes.

Puerperium

This was quite uneventful. The mother made excellent progress and was discharged home on 6th January, 1958. A surgical corset was ordered because of the laxity of her abdominal wall.

The Infants

The weights and sexes of the babies were as follows:

Sex	*Weight*		*Name*	*Symbol*
	Pounds	ounces		
Male	5	7	David	A
Female	4	1	Thelma	B
Male	5	1	Anthony	C
Female	3	14	Beverley	D

They were placed in incubators which had been ready in a special nursery for six weeks. Each baby was given "Synkavit" 1 mg. by injection immediately and aqueous penicillin 100,000 units six-hourly for the first two days.

Feeding

For the first three days half-ounce tube feeds of sterile water were given three-hourly, after which bottle feeding with expressed breast milk was established. After two weeks the E.B.M. was replaced by Cow and Gate "Frailac" and this was changed to Cow and Gate "Half Cream" two weeks later. When they were discharged from hospital on 26th January, 1958, all four infants were healthy and normal and their weights were: David, 9 pounds 9 ounces; Thelma, 7 pounds 7 ounces; Anthony, 8 pounds 9 ounces; Beverley, 6 pounds 13 ounces.

Blood Groups

The blood groups, with the Rhesus phenotypes and probable genotypes are listed below (Table I).

The Placenta

The placenta was received (W.J.H. and D.B.) one hour after delivery. It consisted of one large mass to which three cords were attached and an

TABLE I

Symbol	ABO	Rhesus Phenotype	Probable Genotype	MN	S	P	Lu^a	Kell	Le^b	Fy^a
"A"	O	CcDee	CDe/cde	MN	+	+	−	−	−	+
"B"	O		cde/cde	MN	+	−	−	−	−	+
"C"	O	CcDee	CDe/cde	MN	+	−	−	−	−	+
"D"	O		cde/cde	MN	+	−	−	−	−	+

FIG. 1

A radiograph of the abdomen of the mother, showing the disposition of the quadruplets.

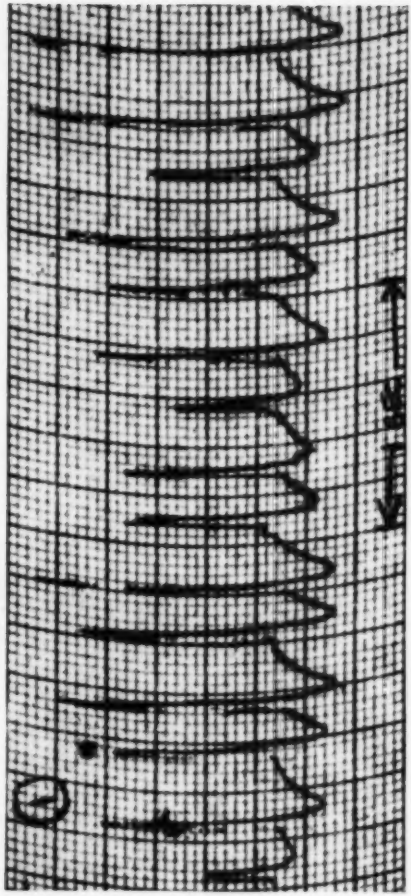

FIG. 2
An electrocardiographic tracing of the foetal hearts.

FIG. 3

A photograph of the quadruplets at the age of 5 months.
A = David; B = Thelma; C = Anthony; D = Beverley.
(Reproduced by the courtesy of the Proprietors of the *Daily Express*.)

FIG. 4

A photograph of the foetal side of the placentae after injection with coloured gelatine.
A=David; B=Thelma; C=Anthony; D=Beverley.

additional single placenta from which the fourth cord arose somewhat eccentrically. The main placenta was divided into two large lateral components and a smaller central mass. One lateral component had two small succenturiate lobes. Each part of the main placenta was surrounded by a chorionic sac which was firmly fused to its neighbour and when viewed from the maternal surface no obvious demarcation could be seen. The small placenta, which had occupied the lower part of the body of the uterus, was circumvallate where it overlapped the larger one. The site of attachment of the cords is shown in Figure 4, which also indicates the reference letters of the four placentae and infants.

Each umbilical vein was cannulated in turn and injection commenced, using 15 per cent gelatine solutions containing "Boston" powder dispersion in various colours.

The vein of placenta "B" was first injected, using 150 ml. of yellow solution. As none of the gelatine appeared in the circulation of the adjacent placentae, the veins of these were likewise injected using a black solution for placenta "C" and blue for placenta "A". As it was now apparent that there was no communication between the veins of these placentae, the arteries were next treated.

Green gelatine solution was injected into one artery of placenta "B" and red solution into one artery each of "A" and "C". None of these injections crossed from one placenta to its neighbour and it was concluded that there was no common circulation between them. Finally the vein of the separate placenta "D" was injected with white gelatine solution and the artery with red.

After completing the injections the maternal surface of the specimen was examined. The central placenta "B" stood out from its neighbours in bright yellow and it was apparent that no circulatory cross over had taken place. At this stage we (W.J.H. and D.B.) were unaware of the sex of the infants, but concluded that four separate ova had probably been involved.

The specimen was fixed in 10 per cent formalin for six weeks, after which segments between adjacent placentae were removed, sectioned and examined microscopically. The distribution confirmed that none of the injected dye had passed across from the circulation of any one placenta to that of its neighbour.

Previous Cases of Quadruplets

It is understandable that in preparing a case of this nature for publication the literature on

Table II

No.	Identification	Configuration	Reference
1	"Perricone", U.S.A.	B. B. B. B.	Gardner, I. C., and Newman, H. H. (1940)
2	"Morlock", U.S.A.	*G. G. G. G.*	Clarke, A. E. (1932)
3	"Schenses", U.S.A.	G. G. B. B.	Gardner, I. C., and Newman, H. H. (1944)
4	"Wycoff", U.S.A.	Not known (3 G. 1 B.)	Pryor, J. W. (1936)
5	"Kaspar", U.S.A.	G. *B. B. B.*	Gardner, I. C., and Newman, H. H. (1943)
6	"Badgett", U.S.A.	*G. G.* G. B.	Gardner, I. C., and Newman, H. H. (1948)
7	"Lashley", U.S.A.	*G. G.* G. B.	Bruce, J. W., and Scott, E. P. (1944)
8	Case of Bowyer and Corner, U.S.A. ..	G. B. B. B.	Bowyer, T. S., and Corner, G. W. (1947)
9	Case of Ryan and Wislocki, U.S.A. ..	G. B. *B. B.*	Ryan, R. R., and Wislocki, G. B. (1954)
10	St. Neots, England	G. B. *B. B.*	Harrison, E. H. (1935)
11	"G", Bristol, England	G. G. G. G.	*Daily Express* (1948)
12	"T", London, England	G. B. *B. B.*	*Daily Mail* (1948)
13	Westminster, England	*G. G. G. G.*	Searle, W. N., and Denny, F. (1953)
14	"B", Stepney, England	G. G. B. B.	Present case
15	Australia	G. G. B. B.	Schmidt, E. E., and Vickers, T. H. (1956)
16	Australia	G. G. B. B.	Elliot, M. E. H., and Hewitt, G. H., Elphinstone, K., and Ostinga, A. J. (1951)

Total: Girls, 38; Boys, 30.

Note: Uniovular infants are indicated by italic capitals.

surviving quadruplets should have been fairly widely investigated. Sixteen cases published in the English language in the past thirty years are analyzed in Table II, which gives the configuration of each pregnancy where known and also the total ratio of girls to boys. Every possible combination of ovulations has occurred in this series, with the exception of double monozygotic twins, often stated never to appear; although in this respect it is worth recalling that Diddle and Burford (1935) described a stillborn pregnancy which seems to have been of this type.

The evidence for the configuration in these cases is somewhat variable. Most of the American quadruplets have been investigated by fingerprinting and in the case of the Badgett babies the configuration was eventually decided on this evidence above all other. In the British and Australian cases, clinical data and blood grouping were felt to be sufficient to identify the relationship.

Summary

(1) A new case of surviving British quadruplets is described. These are the first to go to full-term and, weighing in all some 18 pounds, would appear to be the second heaviest ever reported.

(2) The reasons for delivery by Caesarean section are set out and the results have, in this case, been fully justified.

(3) After delivery the placental vessels were injected with coloured gelatine solutions, which established that there were four independent circulations.

(4) The sex of the infants in relation to each placental mass finally established that four ova must have been fertilized.

(5) The blood groups of the infants were determined and are described in detail.

Acknowledgments

The management of any case of quadruplets necessarily involves the services of a large number of individuals and it is impossible to thank adequately all of those concerned in this instance.

We would, however, particularly acknowledge the assistance of the Matron and all the nursing staff of the East End Maternity Hospital, London, for their help in the early care of the infants; also Messrs. Oxygenaire who not only supplied the incubators but made them available to us free of charge for 6 weeks before the birth of the infants and Messrs. Cow and Gate, Guildford, who supplied "Frailac" and "Half Cream" for the infants. We are also indebted to Messrs. Cow and Gate for defraying the cost of the coloured block in this publication.

We wish also to thank Dr. E. Hardy, haematologist, for his blood investigations. To the Proprietors of the *Daily Express*, we are grateful for permission to publish Figure 3. Finally we are indebted to Dr. H. G. Calwell of Whitehead and Mr. H. MacL. Currie of King's College, London, for the help they have given to us with the translation of Latin text.

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PATHOLOGY AND THE CONSERVED OVARY

BY

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IN a previous article (Whitelaw, 1958) it was stated that some gynaecologists invariably remove the ovaries when performing a hysterectomy. Their two main arguments for so doing were mentioned and the validity of one of them was examined in some detail.

It is perhaps fitting therefore that some consideration be given to the second argument which is that, by removing the ovaries, the surgeon obviates the possibility that the patient may in future suffer from some pathological condition of these organs and in particular from ovarian neoplasm.

Reycraft (1955), in a survey of the statistical records of the Cleveland University Hospitals for the years 1944 to 1953, found only 9 cases of carcinoma arising in ovaries which had been conserved when the uterus had been removed, an estimated incidence of 0·2 per cent.

Counseller, Hunt and Haigler (1955), approaching the question from another aspect, surveyed "more than 1,500 cases of proved carcinoma of the ovary" occurring between the years 1930 and 1952, and found that 67 of the patients, or 4·5 per cent had already undergone the operation of hysterectomy for a benign condition. Though less reassuring than Reycraft's figures, to those whose habit it is to preserve the apparently healthy ovary, these statistics give no real impression of the incidence of malignant disease in ovaries that have been conserved at hysterectomy, since they give no idea of the number of hysterectomies with conservation of ovaries which were performed to produce these 67 cases of ovarian carcinoma.

Randall and Gerhardt (1954), basing their assessment on the statistics of the Health Departments of the States of Connecticut and New York (excluding New York City), have calculated that the "probability" of a woman who has attained the age of forty developing carcinoma of the ovary is 0·9 per cent.

A search for comparable British statistics on this subject has proved to be quite fruitless. It was therefore decided to conduct a survey of this problem, based on the records of a large British teaching hospital.

METHOD

The records of one of the units of the Glasgow Royal Samaritan Hospital for the years 1927 to 1948 were examined, as well as the records of all three units for the years 1948 to 1955. From these examinations two distinct surveys were made.

In the first, a comprehensive list was compiled of every case in which a hysterectomy had been performed with conservation of one or both ovaries, and the records of each of these patients were carefully and individually scrutinized to discover whether or not the patient was subsequently re-admitted and found to be suffering from disease of the ovaries. Where this was observed to have occurred, the date and details of the occasion were noted.

In the second survey, a list was made of all cases of oöphorectomy and ovariotomy, as well as of laparotomy for what appeared to be ovarian pathology. Once again the case records of each woman were individually examined to ascertain if the patient had undergone the operation of hysterectomy, and where this was so the details were recorded.

The work was facilitated by the fact that, in this particular hospital, the patient's clinical notes are entered on a case record in which, under a printed heading, space is specifically allotted to previous operations (nature, place and date). As this form of case record has, for thirty years, been in use in the hospital, and as successive house surgeons have been obliged to complete these case records, the possibility of a previous hysterectomy not being mentioned in the notes becomes slight. Moreover, in the Glasgow Royal Samaritan Hospital, a patient admitted for the first time is given a number in the clinical records of the hospital, and should she be re-admitted at a subsequent date, the notes relating to her re-admission are filed under the same number. All records dealing with the various occasions on which she may have been admitted to this hospital are therefore filed in one folder under one number. Admissions, previous and subsequent to a specific date, are in consequence easy to obtain.

As the card index system had been in operation in one of the units of this hospital since the year 1927, permission to examine the records of that particular unit was requested. This request was kindly granted.

The records of the other two units were not scrutinized over an equally long period, as in neither had the card index system been in operation until comparatively recently.

From 1948 onwards, however, the very comprehensive card index system of the Pathology Department made it easy for one to obtain such information as was required about all cases of hysterectomy and oöphorectomy from all three units of the hospital.

Results

Cases of Hysterectomy with Conservation of One or Both Ovaries

		Per cent
Total number of cases	1,215	
Number of re-admissions for ovarian pathology	4	0·33
Number of re-admissions for malignant disease of the ovary	Nil	

Cases of Oöphorectomy and Ovariotomy plus Cases of Laparotomy with Possible Ovarian Pathology

		Per cent
Total number of cases	872	
Number having had previous hysterectomy	4	0·46
Number of cases of malignant ovarian disease having had previous hysterectomy	1	

In the former of these two investigations, the records of one of the three units of the Glasgow Royal Samaritan Hospital for Women for the years 1927 to 1955 were surveyed, as well as the records of the two remaining units for the years 1948 to 1955 inclusive. These two sources together produced a total of 1,215 cases in which hysterectomy had been performed with conservation of one or both ovaries.

In only 4 of these cases had the patient been re-admitted to hospital at a later date and been found to have a pathological condition of the ovary, and there was no instance of a re-admission disclosing that a conserved ovary had undergone malignant change.

A parallel investigation, covering the same years and units was also conducted, in which the records relating to all cases of oöphorectomy and ovariotomy were examined, to discover whether or not the patients had previously undergone the operation of hysterectomy. Not only so, but in order that no case of inoperable carcinoma of the ovary might be excluded, all records of laparotomies were read carefully to ascertain whether or not the patient had, at some previous date, had her uterus removed.

The total number of cases thus disclosed was 872, and in 4 instances the records revealed that the patient had previously undergone the operation of hysterectomy. One of these was a case of adenocarcinoma (of unknown origin) occurring in the right ovary of a woman whose left ovary and uterus had previously been removed, though not at the Royal Samaritan Hospital. In 2 other cases the ovarian condition was benign and in the remaining 1 there was no pathological report on the excised ovary, but the operation notes give no hint that malignant disease was even suspected.

Discussion

It cannot be claimed that the former of these two surveys proves conclusively that of 1,215 women who had hysterectomies performed with conservation of ovaries, not a single one has subsequently developed malignant disease of the ovary. That one or more of these women may have been admitted, for such a condition, to another hospital in this or another country, is, of course, possible. The figures are nevertheless impressive, as the Glasgow Royal Samaritan Hospital draws its patients from a large area in the West of Scotland. It is also safe to assume that, had any of these women developed ovarian disease at a subsequent date, she would, if still resident in the same area, very probably have been re-admitted to the Samaritan Hospital.

It is, of course, a valid criticism of this investigation that it cannot attempt to assess the percentage of those 1,215 women who are still alive and may yet develop malignant disease of the ovaries, and it is appropriate to recall that the follow-up becomes progressively shorter as one approaches the year 1955.

When, however, all the limitations of this survey have been considered, it remains a significant fact that careful examination of the records of 1,215 women who had hysterectomies performed during the years 1927 to 1955 failed to reveal one single instance of a patient having been re-admitted for malignant disease of the ovary and only 4 who required to have an ovary removed for a benign pathological condition.

In the second survey an attempt was made to gain some idea of the incidence of previous hysterectomy among women suffering from ovarian disease which required surgical treatment.

That group of cases in which uterus and ovaries were together removed because of ovarian pathology was not determined, the survey being restricted to cases of oöphorectomy and ovariotomy, as well as to a few cases where laparotomy alone was performed and in which the pathology was possibly ovarian.

Of the 872 women included in these categories, it was discovered that 3 who suffered from innocent ovarian conditions had previously had the uterus removed.

While it is true that the records also revealed 1 case of adenocarcinoma of the ovary in a patient who had previously had her uterus and other ovary removed, it must also be noted that the pathologist recorded his inability to identify the origin of the tumour, which may therefore have been secondary to a malignant growth in an organ other than the uterus.

Summary and Conclusions

The object of this survey was to obtain statistical information concerning the incidence of pathological change, and in particular of malignant change, in ovaries conserved at hysterectomy.

The subject is an important one as the possibility of the conserved ovary subsequently becoming diseased has been used to justify routine oöphorectomy when the uterus has to be removed for a benign condition.

Precise information on this question is difficult to obtain, and no important investigation of this problem would appear to have been undertaken recently in this country.

In a survey of 1,215 cases in which hysterectomy with conservation of one or both ovaries was performed during the years 1927–1955 in the Glasgow Royal Samaritan Hospital for Women, it was disclosed that 4 of the patients were subsequently re-admitted to that hospital and found to have pathological conditions of the ovary. No instance was discovered of a patient having been re-admitted and found to have malignant ovarian disease.

In a parallel series of 872 women who had undergone oöphorectomy, ovariotomy or laparotomy for conditions which might have been ovarian, it was found that 4 of the patients had previously had the uterus removed. One of these was a case of adenocarcinoma of the ovary but doubt was expressed by the pathologist about the origin of the tumour.

While the limitations of these surveys are appreciated and stated, it is felt that they indicate that the risk of malignant disease developing in ovaries conserved at hysterectomy has probably been exaggerated by some gynaecologists who argue that when hysterectomy is performed for a benign condition, the ovaries ought also to be

removed lest they should subsequently undergo neoplastic change.

I wish to thank the Senior Consultants of the Glasgow Royal Samaritan Hospital for granting me access to their case records and to the Pathologist, Dr. J. McBride, for permitting me to use the Card Index of the Pathology Department.

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IN VITRO STUDIES OF THE MOTILITY OF THE HUMAN UTERUS

Part IV—The Effects of Oxytocin, Methylergometrine, Dihydroergotamine and Two New Oxytocics on the Spontaneous Motility in Different Parts of the Pregnant and Non-pregnant Uterus

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IN previous papers the spontaneous motility in different parts of the non-pregnant and pregnant uterus was described (Part I–II: Sandberg *et al.*, 1957, 1958a). The pharmacological effects of adrenaline, noradrenaline and acetylcholine on the spontaneous motility were studied in a subsequent paper (Part III: Sandberg *et al.*, 1958b). This paper is a further study in this series.

MATERIAL AND METHODS

The material was collected and treated in the same manner as described previously (Sandberg *et al.*, 1958b) and the experimental technique and the estimation of effects were identical.

Oxytocin was given as the synthetic product Syntocinon (Sandoz), which has the same oxytocic effect as the naturally occurring purified oxytocin preparation on the uterus of different species, rat, rabbit, cat, woman (Konzett, Berde and Cerletti, 1956)—and methylergometrine in the form of maleate as Methergin (Sandoz). Dihydroergotamine was used in the form of methansulphonate in the original preparation of Sandoz. The new oxytocics were 2-(2,6-dimethyl-piperidyl)-N-methyl-naphthalene hydrochloride (Ph 261) and 3-(2-methyl-piperidyl)-N-methyl-indole hydrochloride (Ph 86) described by de Jongh *et al.* (1959) and de Jongh and van Proosfij-Hartzema (1952), respectively.

RESULTS

Oxytocin

In the non-pregnant uterus oxytocin was given in doses of 0·0025–0·025 I.E./ml. and for the pregnant uterus 0·0005–0·025 I.E./ml. No qualitative difference in the response between the doses used could be demonstrated. Therefore the results of different doses are listed together in Table I and examples of responses are shown in Figure 1.

The response of the corpus and the isthmus to oxytocin differs during the different sexual phases and during pregnancy. The frequency is most affected by oxytocin, being decreased in the non-pregnant isthmus and increased in the pregnant uterus.

In the non-pregnant corpus there is no difference in response between the proliferative and secretory phases unless in the tonus, regarding which the corpus seems to be more sensitive to oxytocin during the proliferative

TABLE I

The Effects of Oxytocin on Human Uterus In Vitro *Tested on 31 Non-Pregnant and 12 Pregnant Uteri*

Parameter		Non-Pregnant Uterus				Pregnant Uterus	
		Corpus		Isthmus			
		Proliferative	Secretory	Proliferative	Secretory	Corpus	Lower Segment
Incidence of response		25/40 63%	29/43 67%	26/44 59%	26/35 74%	36/40 90%	25/46 54%
Change of motility pattern (per cent)		16	10	8	8	64	64
Tonus	Increase (per cent) ..	52	27	0	0	80	48
	Unchanged (per cent)	36	73	100	96	20	52
	Decrease (per cent) ..	12	0	0	4	0	0
Frequency	Increase (per cent) ..	28	34	15	27	86	84
	Unchanged (per cent)	32	17	23	4	11	16
	Decrease (per cent) ..	40	49	62	69	3	0
Amplitude	Increase (per cent) ..	12	24	27	34	58	68
	Unchanged (per cent)	68	42	46	54	17	20
	Decrease (per cent) ..	20	34	27	12	25	12
Amplitude Maximum	Increase (per cent) ..	32	24	27	31	80	80
	Unchanged (per cent)	52	62	46	54	20	20
	Decrease (per cent) ..	16	14	27	15	0	0

phase ($P=0\cdot05$). The non-pregnant corpus is in general rather insensitive to oxytocin.

In the non-pregnant isthmus the only demonstrable effect of oxytocin is a decrease in frequency, and no difference between the phases is observed.

A comparison between the non-pregnant corpus and isthmus shows a pronounced difference only as regards the tonus. In the corpus tonus is increased only in the proliferative phase. In the isthmus the tonus is completely unchanged after oxytocin both in the proliferative and the secretory phases.

In the pregnant uterus at term there is a marked increase in the sensitivity to oxytocin. It is worth noticing that no decrease was observed in the tonus, frequency or amplitude maximum. Oxytocin causes a pronounced change of motility pattern both in the corpus and the isthmus.

In the pregnant uterus the corpus is more sensitive to oxytocin than is the lower segment as is shown by the incidence of response and the tonus, the P-values being $<0\cdot02$ and $<0\cdot001$, respectively.

Methylergometrine

In the non-pregnant uterus methylergometrine was administered in doses of 0·25–2·5 μg./ml. and for the pregnant uterus 0·25–1 μg./ml. No qualitative difference in response to

the various doses used was found. Therefore the results of different doses are listed together in Table II and examples of responses are given in Figure 2, A.

The frequency is most susceptible to methylergometrine. It is decreased in the non-pregnant and increased in the pregnant uterus.

The non-pregnant uterus is as a whole rather insensitive to methylergometrine except regarding frequency, which is decreased in the isthmal region. No difference in sensitivity between the proliferative and the secretory phases can be demonstrated either in the corpus or in the isthmus.

In the pregnant uterus methylergometrine causes as a whole stronger responses than in the non-pregnant organ. This is shown by the fact that in the pregnant uterus the responses were often estimated as ++ or +++, whereas in the non-pregnant uterus the responses never exceeded +. The lower segment is more sensitive to methylergometrine than the corpus in all parameters tested except the incidence of response and tonus.

Dihydroergotamine

In the non-pregnant as well as the pregnant uterus dihydroergotamine was administered in

TABLE II

The Effects of Methylergometrine on Human Uterus In Vitro, *Tested on 39 Non-Pregnant and 21 Pregnant Uteri*

Parameter		Non-Pregnant Uterus				Pregnant Uterus	
		Corpus		Isthmus		Corpus	Lower Segment
		Proliferative	Secretory	Proliferative	Secretory		
Incidence of response		25/44 57%	30/49 61%	25/46 53%	11/16 69%	24/35 69%	46/67 68%
Change of motility pattern (per cent)		20	27	16	45	13	32
Tonus	Increase (per cent) ..	24	33	8	45	58	41
	Unchanged (per cent)	48	53	92	46	38	55
	Decrease (per cent) ..	28	14	0	9	4	4
Frequency	Increase (per cent) ..	24	17	16	36	58	78
	Unchanged (per cent)	40	30	12	9	4	17
	Decrease (per cent) ..	36	53	72	55	38	5
Amplitude	Increase (per cent) ..	32	20	24	18	29	57
	Unchanged (per cent)	32	57	72	37	33	39
	Decrease (per cent) ..	36	23	4	45	38	4
Amplitude Maximum	Increase (per cent) ..	20	30	32	9	50	76
	Unchanged (per cent)	60	63	64	73	46	22
	Decrease (per cent) ..	20	7	4	18	4	2

doses of 2·5–20 μg./ml. No qualitative difference in the response between the doses used could be demonstrated. Therefore the results of different doses are listed together in Table III and examples of responses are shown in Figure 3.

The characteristic effects caused by dihydroergotamine are decreased frequency, unchanged or decreased tonus.

In the non-pregnant uterus no difference between proliferative and secretory phases is found either in the corpus or in the isthmus. No difference between corpus and isthmus can be demonstrated.

In pregnancy the corpus and the lower segment show the same sensitivity to dihydroergotamine.

A comparison between the pregnant and non-pregnant uterus shows no difference, i.e., the sensitivity to dihydroergotamine is the same in corpus and isthmus both in the pregnant and non-pregnant uterus.

Ph 261

In the non-pregnant uterus, Ph 261 was given in doses of 1–10 μg./ml. and for the pregnant uterus 0·25–2·5 μg./ml. No qualitative difference in response to the various doses used was found. Therefore the results of different doses

TABLE III

The Effects of Dihydroergotamine on Human Uterus In Vitro *Tested on 34 Non-Pregnant and 15 Pregnant Uteri*

Parameter		Non-Pregnant Uterus				Pregnant Uterus	
		Corpus		Isthmus			
		Proliferative	Secretory	Proliferative	Secretory	Corpus	Lower Segment
Incidence of response		28/33 85%	47/51 92%	33/47 70%	33/54 61%	31/39 80%	38/42 91%
Change of motility pattern (per cent)		7	8	12	9	0	13
Tonus	Increase (per cent) ..	7	4	9	0	10	8
	Unchanged (per cent)	47	38	55	76	74	92
	Decrease (per cent) ..	46	58	36	24	16	0
Frequency	Increase (per cent) ..	11	17	6	21	3	10
	Unchanged (per cent)	32	17	30	15	13	16
	Decrease (per cent) ..	57	66	64	64	84	74
Amplitude	Increase (per cent) ..	32	26	24	33	16	5
	Unchanged (per cent)	29	55	43	52	71	58
	Decrease (per cent) ..	39	19	33	15	13	37
Amplitude Maximum	Increase (per cent) ..	4	6	12	21	13	8
	Unchanged (per cent)	53	43	52	55	68	58
	Decrease (per cent) ..	43	51	36	24	19	34

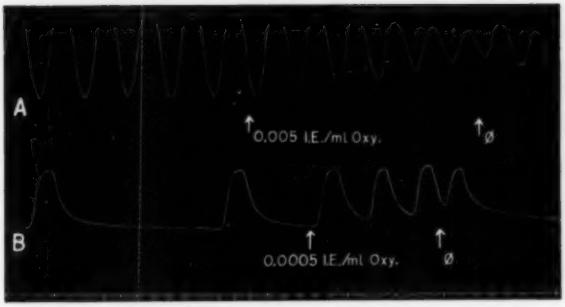
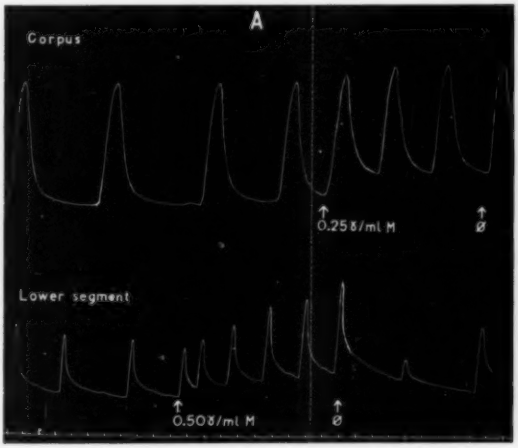


FIG. 1

A.—The effect of Oxytocin (Oxy) on the corpus of non-pregnant uterus in the proliferatory phase.

B.—The effect of Oxytocin (Oxy) on the corpus of the pregnant uterus at term.

Time scale: 1 minute.



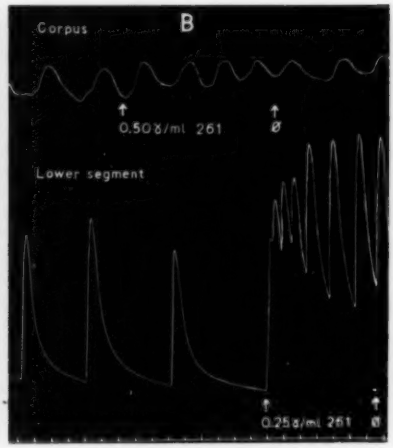


FIG. 2

A.—The effect of methylergometrine (M) on the corpus and lower segment of the pregnant uterus at term.

B.—The effect of Ph 261 (261) on the corpus and lower segment of the pregnant uterus at term.

Time scale: 1 minute.

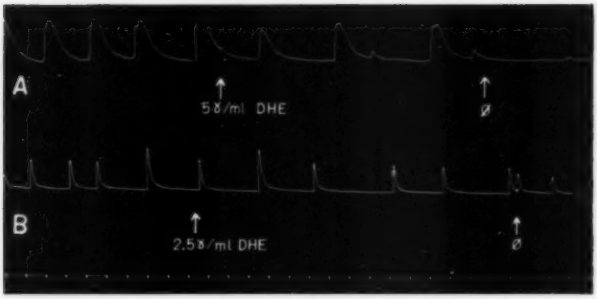


FIG. 3

A.—The effect of dihydroergotamine (DHE) on the isthmus of the non-pregnant uterus in the proliferative phase.

B.—The effect of dihydroergotamine (DHE) on the lower segment of the pregnant uterus at term.

Time scale: 1 minute.

TABLE IV

The Effects of Ph 261 on Human Uterus In Vitro *Tested on 21 Non-Pregnant and 21 Pregnant Uteri*

Parameter		Non-Pregnant Uterus				Pregnant Uterus	
		Corpus		Isthmus			
		Proliferative	Secretory	Proliferative	Secretory	Corpus	Lower Segment
Incidence of response		37/48 77%	24/25 96%	25/34 74%	11/19 58%	33/41 81%	58/64 91%
Change of motility pattern (per cent)		30	17	28	9	15	36
Tonus	Increase (per cent) ..	65	67	32	18	67	65
	Unchanged (per cent)	27	29	68	82	30	35
	Decrease (per cent) ..	8	4	0	0	3	0
Frequency	Increase (per cent) ..	30	46	44	18	67	88
	Unchanged (per cent)	49	33	20	9	21	3
	Decrease (per cent) ..	21	21	36	73	12	9
Amplitude	Increase (per cent) ..	46	17	12	27	58	48
	Unchanged (per cent)	11	21	44	64	39	31
	Decrease (per cent) ..	43	62	44	9	3	21
Amplitude Maximum	Increase (per cent) ..	70	21	24	35	45	71
	Unchanged (per cent)	30	75	56	56	52	28
	Decrease (per cent) ..	0	4	20	9	3	1

are listed together in Table IV and examples of responses are given in Figure 2, B.

The characteristic effects are increased or unchanged tonus and amplitude maximum.

The non-pregnant corpus is more sensitive to Ph 261 in the proliferative phase than in the secretory phase as demonstrated by the amplitude ($P=0{\cdot}01$) and the amplitude maximum ($P<0{\cdot}001$). In the isthmus no difference can be demonstrated.

In the pregnant uterus there seems to be a tendency to greater sensitivity in the lower segment as compared with the corpus.

As a whole the pregnant uterus is more sensitive to Ph 261 than the non-pregnant uterus.

Ph 86

In both the non-pregnant and pregnant uterus Ph 86 was given in doses of 1–10 μg./ml. No qualitative difference in the response between the doses used could be demonstrated. Therefore the results of different doses are listed together in Table V.

The characteristic effects are increased or unchanged tonus and amplitude maximum.

In the non-pregnant uterus no significant difference was found between the proliferative and secretory phases either in the corpus or in the isthmus. The corpus and the isthmus showed the same sensitivity to Ph 86.

In the pregnant uterus the lower segment is more sensitive than the corpus.

TABLE V

The Effects of Ph 86 on Human Uterus In Vitro *Tested on 20 Non-Pregnant and 8 Pregnant Uteri*

Parameter		Non-Pregnant Uterus				Pregnant Uterus	
		Corpus		Isthmus			
		Proliferative	Secretory	Proliferative	Secretory	Corpus	Lower Segment
Incidence of response		10/12 83%	22/27 82%	25/32 78%	13/17 76%	19/25 76%	33/35 94%
Change of motility pattern (per cent)		40	27	36	31	21	70
Tonus	Increase (per cent) ..	80	73	40	62	90	82
	Unchanged (per cent)	20	27	60	38	5	18
	Decrease (per cent) ..	0	0	0	0	5	0
Frequency	Increase (per cent) ..	30	23	64	54	58	91
	Unchanged (per cent)	70	59	16	31	32	9
	Decrease (per cent) ..	0	18	20	15	10	0
Amplitude	Increase (per cent) ..	20	14	40	15	16	73
	Unchanged (per cent)	30	36	36	46	37	9
	Decrease (per cent) ..	50	50	24	39	47	18
Amplitude Maximum	Increase (per cent) ..	60	45	48	46	58	82
	Unchanged (per cent)	30	50	44	46	42	18
	Decrease (per cent) ..	10	5	8	8	0	0

A comparison between pregnant and non-pregnant uterus showed a tendency to increased sensitivity in the pregnant uterus, especially in the lower segment.

DISCUSSION

In the present paper a comparison is made between the effects of substances representing three chemically different groups:

(1) Oxytocin as the naturally occurring octapeptide.

(2) Ergot alkaloids: methylergometrine and dihydroergotamine.

(3) Synthetic indole and naphthalene derivatives: Ph 86 and Ph 261.

A common effect for all these substances is a high incidence of response.

As regards the tonus, oxytocin has its greatest effect on the corpus both in the non-pregnant and pregnant uterus. This is not observed in the case of the other substances tested.

In the pregnant uterus the corpus is more sensitive to oxytocin than is the lower segment in conformity with the observation of Robson (1933) but in contrast to that of Russell (1943). This finding is in contrast to the other oxytocics investigated, which usually show their greatest effect on the lower segment.

Concerning differences between the sexual phases oxytocin and Ph 261 are the only substances that show a higher response in the proliferative phase. The greater effect of oxytocin in the proliferative phase was previously shown by Knaus (1929).

Qualitative differences are observed when the ergot alkaloids methylergometrine and dihydroergotamine are compared, especially in the pregnant uterus, where methylergometrine gives increased tonus and frequency whereas dihydroergotamine produces no change in tonus and marked decrease in frequency. Analogous differences are observed when dihydroergotamine is compared with the other substances tested.

Dihydroergotamine typically produces a decrease in frequency and as a whole its effects are mainly inhibitory in contrast to the other substances investigated. These findings are in conformity with the results of Garrett (1955). On the other hand Rothlin and Berde (1954), in a study of the *in vitro* effects of ergot alkaloids on the lower segment of the human pregnant uterus at term, claim that there is no qualitative difference between methylergometrine and dihydroergotamine, although the oxytocic effect of dihydroergotamine is much less pronounced than that of methylergometrine. Their results are definitely opposed to those of the present investigation.

A comparison between the synthetic products Ph 86 and Ph 261 shows great similarities in their oxytocic effect, being of the same type as those given by methylergometrine. However, as a whole, the synthetic products exerted stronger *in vitro* effects on the non-pregnant uterus than methylergometrine.

Summary

The effects of oxytocin, methylergometrine, dihydroergotamine, Ph 86 and Ph 261 have been tested on the corpus and isthmus of the human non-pregnant and pregnant uterus using the Magnus-Kehrer technique. The results were statistically analyzed in relation to six parameters listed in Tables I–V.

The oxytocic effect, i.e., increase in tonus, frequency, amplitude and amplitude maximum, of *oxytocin* is only found in the pregnant uterus, where the corpus shows greater sensitivity than the lower segment.

Methylergometrine has an oxytocic effect only on the pregnant uterus, the lower segment being most susceptible. The non-pregnant uterus is on the contrary rather insensitive to methylergometrine.

The sensitivity to *dihydroergotamine* is the same in the corpus and in the isthmus, both in the pregnant and non-pregnant uterus. Its effects are mainly inhibitory, the characteristic response being decreased frequency.

Ph 261 has an oxytocic effect on the non-pregnant corpus and the whole pregnant uterus. The non-pregnant corpus is most sensitive to Ph 261 in the proliferative phase. In the pregnant uterus there is a tendency to greater sensitivity in the lower segment.

Ph 86 as a whole has the same effects as Ph 261 but no differences in sensitivity between the sexual phases can be demonstrated.

We are indebted to Statens Medicinska Forskningsråd for financial support of this investigation.

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LOW SPINAL ANAESTHESIA IN OBSTETRICS

A Review of 2,475 Cases

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"The greatest danger of forceps delivery at the present time is anaesthesia."
Jeffcoate

THE choice of anaesthesia in obstetrics often presents a problem because of the particular risk and difficulties associated with childbirth. Inhalation anaesthesia is most widely used in obstetrics today but it is by no means the ideal form of anaesthesia in all cases of abnormal labour, where the anaesthetist may be presented with an unprepared and exhausted patient, and where signs of foetal distress are evident. Local anaesthesia is being used more frequently for vaginal delivery, and caudal anaesthesia has supporters, both in this country and America.

Spinal anaesthesia is, however, regarded with disfavour by the majority of obstetricians, who consider it a dangerous procedure, but this prejudice has been caused mainly by the failure to distinguish between low and high spinal blocks. Most obstetricians who have used low spinal anaesthesia for operative vaginal delivery have found it to be an almost ideal anaesthetic, with few serious risks or disadvantages.

ANAESTHETIC MORTALITY AND MORBIDITY

The maternal mortality rate has fallen considerably in the last 30 years, and, although the incidence of maternal deaths from anaesthesia is relatively low, anaesthetic deaths are nearly always avoidable. Moir (1956) estimates that anaesthetic fatalities account for 4 per cent to 5 per cent of all maternal deaths, and Parker (1956) analyzes several American reports on maternal mortality and states that from 2 per cent to 10 per cent of all maternal deaths are caused by anaesthesia. Fatalities have been known to occur after inhalational, intravenous, spinal and even local anaesthesia, though it is impossible to compare the mortality rates from different anaesthetics without knowing the relative numbers of anaesthetics given.

Aspiration of stomach contents is undoubtedly the commonest cause of maternal deaths from general anaesthesia. In the recent Report on Confidential Enquiries into Maternal Deaths in England and Wales (Walker *et al.*, 1957) 49 of the 1,410 maternal deaths recorded (an incidence of 3·47 per cent) were attributed to complications of anaesthesia, and of these, 32 were caused by inhalation of stomach contents. Gilliatt (1949), in an analysis of 55 maternal deaths, described 3 fatalities due to inhalation of vomit under anaesthesia. Jeffcoate (1953) reported 3 deaths from inhalation of vomit and Parker (1956) found that 8 out of 205 maternal deaths were caused by aspiration asphyxia.

Culver, Makel and Beecher (1951) conducted experiments on 300 unselected patients by introducing a blue dye into their stomachs

15 to 30 minutes before induction. Regurgitation occurred in 26·3 per cent and 16·3 per cent aspirated gastric contents during anaesthesia, though frank vomiting was seen in only 8 per cent. In the lateral and Trendelenburg positions regurgitation was rather surprisingly found to be three times as common as in the supine position, but the rate of aspiration was no higher. Aspiration was more common in the patients of inexperienced anaesthetists than in those of experienced anaesthetists.

Obstetric anaesthetics are often administered by a junior member of the medical staff, and this factor, combined with the delayed emptying of the stomach during labour, probably accounts for the relatively high incidence of this complication in obstetric patients.

Many instances of maternal deaths from spinal anaesthesia have been recorded, but, as the majority of these anaesthetics were given for Caesarean sections, a low spinal block was obviously not used. Greenhill (1947) considers spinal anaesthesia to be one of the most dangerous of all anaesthetic procedures, and states that the mortality is 5 times as high as that following general anaesthesia. Gordon (1947) in an analysis of 958 puerperal deaths, found that 9 out of 43 anaesthetic deaths followed spinal anaesthesia (given for Caesarean section, version and ectopic pregnancy). Adriani (1948) reported 14 deaths out of 12,500 spinal anaesthetics. The technique and the drugs used were not mentioned but in all 14 cases death was due to respiratory paralysis or circulatory collapse. Lock and Greiss (1955) reported 11 maternal deaths from spinal shock and 1 death from meningitis following a spinal anaesthetic. Nine of the 12 spinal anaesthetics were given for Caesarean sections. Spinal shock can be avoided by using minimal doses of drugs and the "saddle-block" technique.

Maternal deaths from caudal anaesthesia have also been recorded by Gordon, and even local anaesthesia is not entirely without risk. Lock and Greiss reported 2 deaths caused by reactions to local anaesthetics—one for a Caesarean section and the other a pudendal block.

Apart from the mortality risks, general anaesthesia in obstetrics has further disadvantages. Relaxation of the uterus gives rise to an increased tendency to post-partum haemorrhage. Post-anaesthetic vomiting and laryngitis can be very distressing, and respiratory complications are well known.

The use of local anaesthesia, although safer for both mother and infant, is limited in obstetrics as the analgesia is insufficient for many intra-pelvic manipulations. Several cases of idiosyncrasy and overdosage of local anaesthetic drugs have been recorded and vulval haematomata and infection may occur.

No single anaesthetic is suitable for every type of case, but low spinal anaesthesia can be used for the majority of abnormal vaginal deliveries with less risk to both mother and infant than general anaesthesia. Several authors who have reported on their work with low spinal anaesthetics have apparently found the results satisfying. Resnick (1945) reported on 257 cases of low spinal anaesthesia for vaginal delivery, and Rawlings (1950) on a further 511 cases with no anaesthetic deaths and no serious complications. Anderson (1946) and Thorne (1952) have also recorded series of cases with excellent results. In the American literature Parmley and Adriani (1946) described a series of 136 cases with no complications. Andros and Priddle (1950) used low spinal anaesthesia for 4,700 deliveries, with only 2 cases of temporary neurological sequelae.

The Present Investigation

Low spinal anaesthesia with procaine has been used at Oldchurch Hospital, Romford, since 1938 for the majority of operative vaginal deliveries. The method was first introduced into this hospital by Mr. Stanley Henderson, and has since been used by successive consultants, registrars and house-surgeons. Between August, 1938 and December, 1957, out of a total of 31,816 deliveries, 2,448 patients were given spinal anaesthetics. Twenty-seven patients had a second spinal anaesthetic for a subsequent delivery, making a total of 2,475 spinal anaesthetics. The records of these cases have been examined and analyzed. We had hoped to follow up most of these patients with a view to ascertaining the occurrence of late anaes-

thetic complications. A trial follow-up was conducted by sending questionnaires to 150 patients, 10 patients having been selected at random from each of the years 1940 to 1954. Only 76 patients (50·6 per cent) answered, and as this result would not have been statistically significant it was decided that a further follow-up would be useless. Apart from these patients, 952 patients have attended the hospital at various times after being discharged, the majority being seen at the postnatal clinic 6 weeks after delivery, and a few as long as 13 and 14 years later. Three hundred and thirty-one patients have been delivered in this hospital in subsequent pregnancies. Patients who do not attend the postnatal clinic are examined by their general practitioners and referred back to the hospital if necessary.

Out of these 31,816 deliveries there have been no maternal deaths attributable to low spinal anaesthesia.

Technique

A low spinal anaesthetic has been administered in every case, the drug used being a crystalline procaine preparation. In most cases the same person—usually the obstetric house surgeon—gives the anaesthetic and performs the delivery.

Sterilized sets for spinal anaesthesia are kept ready for use in every labour ward. Each set consists of a small rectangular glove drum with sliding ports in the lid and the base, containing a 20 gauge Howard Jones lumbar puncture needle and stilette, a 5 ml. all glass syringe, a No. 1 needle, one ampoule of Procaine Hydrochloride 100 mg., a file, towel and swabs. These sets are sterilized by autoclaving at a pressure of 20 pounds and a temperature of 128 degrees centigrade for 20 minutes. Each box is sealed after sterilization. After use the box is re-packed by a senior midwife who always inserts a fresh ampoule of Procaine, whether the drug has been used or not.

The patient sits on the edge of the bed with her feet resting on a chair. She is asked to bend her head and shoulders forward as far as possible, while a nurse helps to support her and keeps any clothing out of the way.

The operator wears a mask to cover his nose and mouth and scrubs his hands thoroughly with soap and water, drying them on a sterile towel. Gloves are not worn.

For the preparation of the patients' skin, spirit is applied with sterile wool swabs, first to the site of puncture and then to the surrounding skin, always swabbing downwards to the buttocks and using each swab once only. All traces of spirit are finally removed with dry sterile swabs. The site of puncture is the 4th lumbar space, although in cases of difficulty the 3rd lumbar space is sometimes used. Identification of the landmarks is not difficult even in obese patients, and local infiltration of the tissues is unnecessary. The lumbar puncture needle is held by the hub only to avoid contamination of the shaft, and inserted so that the bevel is parallel to the longitudinal fibres of the dura.

When the dura is punctured 2 ml. of cerebrospinal fluid is allowed to drip into the ampoule of procaine, and the solution thoroughly mixed by extrathecal barbotage. The drug is then injected fairly rapidly, using gentle pressure on the plunger of the syringe. The injection is made between contractions to avoid the risk of dislodging the needle. Accidental injection of an air-bubble is avoided by using only three-quarters of the amount of solution in the syringe. In most cases 75 mg. of procaine is an adequate dose.

Macintosh (1951) has shown how a heavy spinal anaesthetic solution injected very slowly sinks in a fine stream to the bottom of a "glass spine" producing analgesia around the anus only. This may explain the occasional failure of a spinal anaesthetic to provide adequate analgesia, particularly in the hands of an overcautious houseman. If the solution is injected more rapidly the whole of the cauda equina is affected, the effect being limited to the lumbar and sacral nerves even if the patient lies down immediately.

Procaine takes 3 to 5 minutes to be absorbed or "fixed" by the nerve roots, so the patient is kept sitting up for this length of time and is then placed in the lithotomy position. During this period the operator can scrub up and gown himself for the delivery. No premedication is given. Usually the patient co-operates extremely well during this procedure and is grateful for

the rapid relief of her pains. She often takes a great interest in the delivery and appreciates the fact that she is conscious when her baby is born.

This technique produces almost complete anaesthesia of the perineum, vulva and vagina, with profound relaxation of the perineal and pelvic muscles. Touch sensation may sometimes be present although pain sensation is lost, and traction on the forceps may cause some alarm if the patient is not reassured. There is also partial analgesia of the legs and thighs, but little or no paresis of the leg muscles. Sensory fibres from the cervix and body of the uterus are also affected so that labour pains are relieved, although there is no alteration in the force or frequency of uterine contractions. The duration of anaesthesia is from 1½ to 2 hours.

Indications

The procedures for which low spinal anaesthesia was used are shown in Table I.

The series included 65 sets of twins and 2 sets of triplets.

Table I

Indications for Anaesthesia	Number of Cases
Total number of infants delivered	2,530
Forceps delivery	1,966
Breech delivery	537
Destructive operations	16
Spontaneous vertex delivery	5
Failed forceps and subsequent Caesarean section	6
Repair of perineal lacerations	14

The period of this survey includes the war years, when shortage of staff was an acute problem in this hospital. Spinal anaesthesia, which was easily administered by a single-handed obstetrician, was thus the anaesthetic of choice for abnormal vaginal deliveries, and has remained so ever since. There has been no selection of cases at any time, apart from those cases in which spinal anaesthesia was obviously contra-indicated.

Forceps Delivery

This group includes high, mid-cavity and low forceps extractions, manual rotation from transverse or occipito-posterior positions, and rotation and extraction with Kiellands forceps. Three cases were delivered as brow presentations, having resisted correction, two were converted from brow to face presentations, and two more were delivered as face presentations.

Fourteen cases were admitted as "failed forceps" having already had a general anaesthetic before admission. In all of these a successful forceps delivery was performed under spinal anaesthesia.

Spinal anaesthesia provides excellent relaxation of the plevic and perineal muscles, and intra-pelvic manipulations are easier than under general or local anaesthesia.

The third stage was managed both with and without intravenous ergometrine. The incidence of post-partum haemorrhage and retained placenta was not high, but, when necessary, manual removal of the placenta was performed without difficulty under spinal anaesthesia.

Breech Delivery

The majority of these patients were primigravidae. As a rule all breech deliveries in primigravidae are conducted under low spinal anaesthesia which is suitable for breech extractions and assisted breech deliveries.

For an assisted breech delivery the anaesthetic is not given until the breech is distending the perineum, as loss of the perineal reflex causes delay in progress. Although not conscious of pain, the patient can be instructed to bear down during contractions and so assist delivery of the buttocks and body, and her efforts are aided by firm fundal pressure. Delivery of the after-coming head is controlled by the use of forceps.

Low spinal anaesthesia provides adequate relaxation and analgesia for any manipulations. A general anaesthetic, with its attendant risk to both mother and infant, is unnecessary for delivery of the shoulders and after-coming head.

Destructive Operations

This group includes 8 cases of perforation and forceps extraction, 4 breech deliveries with

perforation of the after-coming head, 1 decapitation, 2 cleidotomies, and 1 embryotomy. In all these cases a spinal anaesthetic was given before it was realized that destruction of the foetus was indicated. Six patients were given supplementary light general anaesthesia. From the patients' point of view a general anaesthetic would probably have been preferable in every case.

Spontaneous Vertex Delivery

Spontaneous delivery occurred in 5 cases. In 2 of these the anaesthetic apparently provided sufficient relaxation to overcome the delay caused by a rigid perineum. The remaining 3 were second twins, 2 being macerated stillbirths.

Failed Forceps

Six patients in this series required Caesarean section. In 5 cases a forceps delivery was attempted under spinal anaesthesia and in 1 an unsuccessful attempt was made to correct a brow presentation. Failure to deliver by forceps was due to a contraction ring in 2 cases and disproportion in the remaining 3.

The advantage of spinal anaesthesia in a "trial of forceps" is that a thorough unhurried examination can be made and a hand inserted into the uterus to determine the presence of a contraction ring. If a Caesarean section is then indicated the general anaesthetic need not be started until the surgeon is ready, so that there is less likelihood of foetal anoxia.

Contraction rings were found in a further 35 cases after the administration of spinal anaesthesia. As uterine contractions are unaffected by low spinal anaesthesia a contraction ring will not relax as with general anaesthesia. Twenty-one cases required a general anaesthetic before vaginal delivery was possible, while in the remaining 14 the contraction ring relaxed after injection of magnesium sulphate with or without adrenaline.

General anaesthesia was used in 47 cases in this series. In addition to the cases already mentioned general anaesthesia was necessary for internal podalic version in 2 cases. In another 19 cases the spinal anaesthetic failed to give satisfactory analgesia, and a light supplementary general anaesthetic was administered for the delivery.

Repair of Perineal Lacerations

Fourteen patients had extensive second-degree perineal lacerations repaired under spinal anaesthesia. Loss of sensation in the lower limbs undoubtedly makes the lithotomy position bearable for a greater length of time, but, for a simple tear, spinal anaesthesia probably has no advantage over local anaesthesia.

Complications

Severe complications are less likely to occur with low spinal block than with high spinal anaesthesia. The immediate complications of spinal anaesthesia are mainly associated with control of respiration and blood pressure, while the late complications are mainly neurological.

Failure of Administration

Lumbar puncture may be made extremely difficult or even impossible because of bony disease or deformity. If two or three attempts at puncture in the 4th or 3rd lumbar space are unsuccessful the procedure should be abandoned and a general anaesthetic or local anaesthetic used.

Needle Breakage

This uncommon complication, which is usually due to the use of old or damaged needles, occurred in 1 case in the series. The needle was removed 12 days later under local anaesthesia.

Overdosage of Drug

This is also a rare complication and one which should not occur if due care is taken. At this hospital only 100 mg. ampoules of procaine are used and the risk of accidental overdosage thereby eliminated. A case has been known to occur in this area where a patient was given 1 g. of procaine instead of 100 mg. Complete circulatory and respiratory failure followed, but after 2½ hours of artificial respiration, she made a complete recovery, with no untoward sequelae. Macintosh mentions 3 cases of overdosage with procaine although none of them was very seriously affected.

Hypotension

A severe fall in the blood pressure is far more likely to occur with a high spinal than with a low spinal block. According to Keating (1956) the vasoconstrictor nerve fibres, which accompany the anterior nerve roots between the first thoracic and 2nd and 3rd lumbar segments, may be blocked by a spinal anaesthetic. The degree of blood pressure fall depends partly on the number of roots blocked, so that a low spinal anaesthetic limited to the lumbar and sacral segments should not cause a marked fall.

In this series no patient was found to have a severe fall of blood pressure. A fall of 5 to 10 mm. in both systolic and diastolic pressures was fairly common, though in many cases the blood pressure remained unchanged. Parmley and Adriani (1946) found a slight fall in 50 per cent of their patients and a more severe but temporary fall in 50 per cent while Thorne (1952) found a blood pressure fall in 6·25 per cent of his cases. Any risk of hypotension should, of course, be avoided in anaemic or shocked patients.

Circulatory and Respiratory Depression

This is also more likely to occur only if the level of anaesthesia reaches the thoracic segments, and is therefore uncommon with a low spinal block.

No patient in this series showed any signs of circulatory or respiratory depression. Parmley and Adriani (1946) and Anderson (1946) found similar results with low spinal anaesthesia.

Post-operative Complications

The incidence of complications in this series is given in Table II.

Table II

Complications	Number of Cases	Percentages
Headache	589	23·8
Slight	411	16·6
Severe	178	7·2
Nausea and vomiting	54	2·18
Dizziness	16	0·64
Difficulty in micturition	408	16·4
Urinary retention	278	11·2
Incontinence of urine	9	0·36
Incontinence of faeces	2	0·08
Diplopia	2	0·08
Other neurological complications	10	0·4

Headache

This is probably the commonest complication after both spinal anaesthesia and lumbar puncture. The cases in this series have been divided into those with slight headaches, which responded quickly to the usual treatment, and which may not always have been caused by the anaesthetic, and those with severe, persistent headaches, in many instances associated with neck pain or stiffness and occasional photophobia.

In most cases the headache lasted for under a week, but a few persisted for 10 or 12 days, while 2 patients continued to complain of severe headaches for 2 months.

It is generally accepted that the majority of headaches following spinal anaesthesia or lumbar puncture are due to leakage of cerebrospinal fluid through the hole made in the dura by the needle. The resulting loss of support to the brain causes traction on the pain-sensitive structures at the base of the brain.

Excessive leakage of cerebrospinal fluid can be prevented to a certain extent by using the smallest possible needle, by avoiding multiple punctures of the dura and by inserting the needle so that the fibres of the dura are split and not torn. Redlich, Moore and Kimbell (1946) compared the results of lumbar puncture with 16 and 22 gauge needles and found that the symptoms were more severe and prolonged with the larger needle. At this hospital a 20 gauge needle has been found to be the smallest size which can be used without danger of buckling.

Treatment is often unsatisfactory. The pain is usually resistant to drugs such as aspirin and codeine. A few cases are relieved by morphine or pethidine. The application of a firm abdominal binder often provides immediate relief, but as the pain may recur when pressure is released treatment must sometimes be continued until the patient is discharged. Hanahan and Redding (1951) found that an abdominal binder gave the best results in the treatment of headaches. Their theory is that the pressure is

transmitted through the inferior vena cava and the lumbar and intravertebral veins to the plexus of veins surrounding the dural sac. The cerebrospinal fluid pressure is thereby raised and the pain-sensitive areas of the brain lifted from the cranial bed.

Nausea and Vomiting

This complication occurred in 2·18 per cent of the cases in this series, and was usually associated with headache.

Dizziness

In this series 0·64 per cent of the patients complained of dizziness, usually associated with headache, though a few complained of dizziness alone on standing or sitting up. One patient stated that the symptom persisted for 6 weeks. Dizziness may occur after lumbar puncture as well as after spinal anaesthesia, though the cause is unknown. Thorsen (1947) found that 6 per cent of his cases complained of dizziness after lumbar puncture, and 9·1 per cent after spinal anaesthesia.

Urinary Complications

Post-operative difficulty in micturition is a common complication among puerperal patients. In this series 11·2 per cent of the cases had partial or complete urinary retention. Over half of these cases occurred in the first 48 hours after delivery, and only 1 persisted for as long as 13 days. Urinary retention is equally common after instrumental delivery under general anaesthesia, and even spontaneous delivery with an episiotomy or perineal laceration.

Incontinence of Urine

This is a more serious complication, but fortunately a rare one. Nine patients in this series complained of urinary incontinence. Two were incontinent on one occasion only, while 4 suffered from slight incontinence for up to 4 days after delivery. Two others attended the postnatal clinic complaining that they had been incontinent since discharge from hospital, but examination revealed no evidence of muscular or neurological weakness, and no obvious signs of incontinence. The last patient developed incontinence of urine and faeces which lasted for 16 days.

Incontinence of Faeces

Two patients developed incontinence of faeces. One was incontinent of faeces for one day after delivery, and the other, who has already been mentioned, was incontinent of faeces and urine for 16 days.

Sixth-nerve Palsy

Disturbance of vision occurred in only 2 cases in this series. One patient who suffered from severe headaches, developed diplopia 11 days after the spinal anaesthetic, and the second complained of diplopia alone 9 days later. The first patient recovered within 3 days, and the second gradually improved over a period of 6 weeks.

Paralysis of the 6th cranial nerve is known to occur after diagnostic lumbar puncture. Thorsen found that the incidence of diplopia in his series of cases was 2·4 per cent after spinal anaesthesia and 2 per cent after lumbar puncture. According to Bryce-Smith and Macintosh (1951) movement of the cerebrum, caused by the fall in cerebrospinal fluid pressure, stretches the abducent nerve over the apex of the petrous part of the temporal bone so that conduction along the nerve is blocked. Paralysis of all the other cranial nerves except the 1st and the 10th has been recorded, but we have not encountered any cases.

Other Neurological Complications

Ten patients in this series developed neurological symptoms after spinal anaesthesia. Five patients complained of numbness of the lower limbs, varying in distribution from a big toe to both legs and starting between 1 day and 1 month after the anaesthetic, though in 1 case the condition had been present before delivery. The symptoms improved within a few days in every case.

Two patients complained of weakness of one leg starting 5 days and one month after delivery respectively. The first patient recovered completely in three days, and the second, when examined a month later, was found to have no

muscular weakness but did have a small area of anaesthesia around the lateral malleolus.

There were 2 cases of foot-drop in this group though it is doubtful whether they were caused by the spinal anaesthetic. Both patients recovered completely.

Injury to the sciatic nerve is known to be caused by pressure from the foetal head (Walshe, 1955) and this is more likely to occur after prolonged labour and instrumental delivery. In the last 20 years there have been 3 cases of foot-drop following forceps delivery under general anaesthesia in this hospital.

The last patient, already mentioned, developed incontinence of urine and faeces the day after a spinal anaesthetic, and was found to have an area of anaesthesia around the vulva and anus. Although she had improved considerably before discharge from hospital on the 16th day, she then complained of weakness of her legs. No evidence of muscular weakness was found, however, when she attended the hospital a month later.

Many cases of neurological complications following spinal anaesthesia have been reported but permanent nerve injuries are rare. Ferguson (1937) recorded 13 cases with neurological symptoms of varying severity following spinal anaesthesia, and Kennedy, Effron and Perry (1950) who described 12 cases of grave spinal cord paralysis, consider that paralysis below the waist is too high a price for the patient to pay to provide the surgeon with a relaxed field for operation.

Neurological complications are not unknown after general anaesthesia, and Sinclair (1954) has described a case of ascending spinal paralysis following hysterectomy under general anaesthesia.

According to Macdonald and Watkins (1938) the anaesthetic drug is probably the causal factor in producing neurological symptoms, and their experimental work showed that more severe symptoms occurred with higher concentrations of the drug. Lasting paralysis only occurred when the nerves were bathed by the substance at full concentration, while nerves affected by a diluted solution recovered their function rapidly. Kennedy and his associates (1950) also found that neurological complications occurred in those regions of the central nervous system most closely situated to the site of injection of the anaesthetic compound.

The possibility of previous disease of the central nervous system must always be considered and spinal anaesthesia is probably best avoided in patients who are known to have any neurological disorder.

Septic Meningitis

This is a rare complication of spinal anaesthesia and is usually due to the contamination of the equipment used. Evans (1945) recorded 2 cases of fatal meningitis and Barrie (1941) 11 cases of meningitis following spinal anaesthesia. The infection was traced to the local anaesthetic solution in the first group and to a contaminated water supply used for rinsing the lumbar puncture needles in the second.

There has been no case of meningitis in this series, though an *Escherichia coli* meningitis has occurred in this hospital after a forceps delivery under general anaesthesia.

Respiratory Complications

No patient in this series developed pulmonary complications after spinal anaesthesia.

Maternal Mortality

There were 5 maternal deaths in this series—none of them due to the anaesthetic. There were 2 deaths from post-partum eclampsia, one 2 days and the other 5 days after delivery. Both patients showed signs of severe pre-eclampsia before delivery and should not have been delivered under spinal anaesthesia. In the third case, perforation and forceps extraction of a hydrocephalic infant was performed under low spinal anaesthesia. The patient developed an intrauterine infection 11 days after delivery and died from a streptococcal septicaemia on the 16th day. The fourth patient, who had an additional general anaesthetic for a contraction ring, died from a cerebral thrombosis three days later. The last patient in this group, who had developed incontinence of urine and faeces after delivery, died four months later from homologous serum jaundice caused by a plasma transfusion.

TABLE III

Foetal Loss and Asphyxia	Number of Cases	Per-centages
Total infant mortality ..	174	6·88 (uncorrected)
Stillbirths	115	
Neonatal deaths	59	
Asphyxia neonatorum ..	471	18·6
Asphyxia associated with forceps delivery	331	16·8
Asphyxia associated with breech delivery	140	26·1

EFFECT OF SPINAL ANAESTHESIA ON THE INFANT

A total of 2,530 infants were delivered under spinal anaesthesia in this series. The figures for foetal loss and incidence of asphyxia neonatorum are given in Table III.

Regional anaesthesia has been found to be less detrimental to the infant than general anaesthesia. Taylor, Govan and Scott (1951), in assessing the effects of anaesthetic agents on the oxygen saturation of the blood of newborn infants (all of whom were born spontaneously or by outlet forceps delivery), found that no infants required resuscitation after regional anaesthesia. The oxygen saturation of the blood one hour after delivery was higher when regional anaesthesia was used.

Little and Tovell (1949) reviewed the reports of various authors and found that all general anaesthetics used for maternal anaesthesia decrease the respiratory response of the newborn. In 1,951 cases of spinal anaesthesia 2·2 per cent of the infants suffered from delayed respiration, and only 1·2 per cent required resuscitation. The resuscitation rate was found to be between 4 and 28·6 per cent with ether, over 20 per cent with cyclopropane, and between 6 and 28 per cent with nitrous oxide.

In this series 18·6 per cent of the infants suffered from delayed respiration, although not all of them required resuscitative measures.

The incidence of asphyxia is apparently high compared with American figures, but may be accounted for by the more frequent use of anaesthesia for normal deliveries in American hospitals, whereas the majority of our cases were difficult instrumental deliveries. Morison (1950) points out that the functional reserve of the placenta at term is often dangerously small for a difficult or prolonged labour, so that foetal anoxia is very likely to occur in these cases. "Foetal distress" was the indication for interference in at least 15 per cent of the forceps deliveries, while the asphyxia rate for the same cases was only 16·8 per cent. It would be interesting to compare these figures with a similar series of cases performed under general anaesthesia, but unfortunately we were unable to do so owing to the infrequent use of general anaesthesia in this department.

It is unlikely that any of the stillbirths or neonatal deaths were attributable to spinal anaesthesia, though there is no way of proving this statement as the cause of many perinatal deaths remains unknown. General anaesthesia, on the other hand, is known to cause some infant mortality, either from overdosage or from anoxia.

ADVANTAGES

(1) The anaesthetic can be rapidly and easily given to an unprepared patient and by a single-handed obstetrician.

(2) It can be safely used in pulmonary or cardiac disease and has no ill-effects on the liver or kidneys.

(3) There is no danger of aspiration of vomit during anaesthesia, and post-anaesthetic vomiting is rare.

(4) Complete relaxation of the perineal and pelvic muscles enables intra-pelvic manipulations to be performed with ease.

(5) There is no interference with uterine action and less likelihood of post-partum haemorrhage.

(6) Post-operative pulmonary complications are extremely rare.

(7) The incidence of neonatal asphyxia is far lower than with general anaesthesia.

DISADVANTAGES

(1) Occasional difficulty may be encountered in the administration of the anaesthetic. The presence of local sepsis is a contra-indication.

(2) Spinal anaesthesia should be avoided in shocked patients and in fulminating pre-eclampsia and eclampsia.

(3) The risk of serious neurological complications, though extremely small, is unavoidable.

(4) Intra-uterine manipulations requiring uterine relaxation cannot be performed. A general anaesthetic or other relaxant is necessary when a contraction ring is present.

(5) Hysterical and extremely nervous patients are unsuitable subjects as the patient's co-operation is necessary.

(6) Spinal anaesthesia is contra-indicated in domiciliary obstetrics because of difficulty in maintaining asepsis.

Summary

The records of 2,475 cases of low spinal anaesthesia, used mainly for operative vaginal deliveries, have been analyzed, and the relevant literature reviewed. The technique of administration and the resulting complications have been described.

Out of a total of 31,816 deliveries not one maternal death was attributable to the anaesthetic and significant neurological sequelae were recorded in only one case.

The use of low spinal block was unaccompanied by any serious risks to either mother or infant.

Conclusion

We feel fully justified in claiming that the technique described is the ideal form of anaesthesia for the majority of abnormal vaginal deliveries, and we would like to make a plea for its wider adoption in obstetrics. We are convinced that the results recorded in this survey will help to remove many of the existing prejudices against its use from the minds of obstetricians in this country.

We wish to express our thanks to the National Birthday Trust Fund for their practical help and encouragement. This investigation was made possible by a financial grant to one of us (M.T.P.) by Messrs. Pfizer Ltd., and Messrs. C. H. Boehringer Sohn to whom we are indebted.

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VARIATIONS IN THE MONOAMINE OXIDASE IN THE HUMAN PLACENTA WITH PARITY AND MATURITY

BY

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THE human placenta normally contains a high concentration of monoamine oxidase (Thompson, 1950). The greater amount is probably situated in the maternal placenta and its concentration increases throughout the gestation period. There is no clear cut experimental evidence to explain the functional significance of this enzyme but it may inactivate circulating pressor amines and protect the spiral arteries from vaso-constrictor substances. Foetal distress, of non-mechanical origin, is more frequently seen in the primiparous patient (Dumoulin and Martin, 1957) and in the postmature patient and it is possible that the concentration of monoamine oxidase is low in the placentae of these cases. The purpose of this investigation was therefore to compare the concentration of monoamine oxidase in the placentae from primiparous with those from multiparous cases and in those from term and postmature deliveries.

MATERIAL AND METHODS

Term placentas from unselected patients, delivered after 260 days of pregnancy, were compared with those from postmature cases delivered from 290–320 days.

Within twenty minutes of delivery of the placenta, a portion weighing approximately 20 g. was removed from the maternal surface of the organ; it was stored in solid CO_2 for 3–6 days until the determination of monoamine oxidase activity was carried out.

The placentae were unfrozen just before the preparation of the extracts, weighed and ground with a little sand in a mortar. Two ml. of M/15 sodium phosphate buffer of pH 7·4 were added for each g. of tissue: the extracts were centrifuged for 5 minutes at very low speed; the decanted supernatant was used. Part of it was taken for a manometric determination without further treatment; the remainder was dialyzed against tap water overnight. For the manometric determination each flask contained 0·8 ml. of placenta supernatant (dialyzed or undialyzed) plus 1·0 ml. of the phosphate buffer in the main compartment; in the side bulb there was either 0·2 ml. of water or of 0·1 M tyramine hydrochloride. The temperature was 37·5° C and the gas phase oxygen. The amount of oxygen consumed in the first 20 minutes was used for the calculation of enzymic activity.

RESULTS

The monoamine oxidase activities from the dialyzed and undialyzed supernatant were similar.

Table I shows the numbers of placentae

TABLE I

Placental Monoamine Oxidase Concentration μl./O_2/0·27 g./20 minutes

Maturity	Parity			Mean	S.D.
	Primiparae	Multiparae	Total		
Term	19	14	33	42·57	21·39
Postmature	12	8	20	37·75	20·74
Total	31	22	53		
Mean	42·15	38·77			
S.D.	22·16	19·79			

studied from term and postmature deliveries, the parity of the women and the mean dialyzed amine oxidase concentration, expressed as μl. O_2/0·27 g. placenta/20 minutes, in the four groups. The enzyme values varied widely in each group; this is shown in the figures for the standard deviation and in the accompanying graph. The difference between the mean enzyme

FIG. 1

concentrations in the term and postmature groups is 4·82 μl. O_2/0·27 g./20 minutes and that between the primiparous and multiparous groups 3·38 μl. O_2/0·27 g./20 minutes; these differences were tested by the "t" test and neither was significant at the 0·5 level.

Amongst the 53 patients there were 6 cases of clinical foetal distress: this occurred in 2 term babies of multiparous mothers and in 4 postmature babies of primiparous mothers, all requiring operative procedures. The mean amine oxidase concentration of the placentae in these 6 distressed babies was 53·9 S.D.= 23·56 μl. O_2/0·27 g./20 minutes; this mean value is greater than for the 47 babies which were not distressed 39·07 S.D.=20·36 μl. O_2/ 0·27 g./20 minutes, but, again, this difference was not significant.

DISCUSSION

The amine oxidase activities of the placentae studied fall within the concentration range reported by Thompson and Tickner (1949) when consideration of the difference in quantity of substrate and the time of oxygen uptake is taken into account. In the present study the wide range of values found, and the lack of any statistical evidence for the difference in monoamine oxidase concentration due to parity or maturity, would suggest that a low concentration of this enzyme *per se* would therefore not appear to be a common factor contributing to the increased incidence of foetal distress in primiparous and postmature patients. It is noteworthy that one of the highest values for monoamine oxidase concentration, 93 μl. O_2/ 0·27 g./20 minutes, was obtained in the placenta of a primiparous patient delivered 14 days past term by Caesarean section in the first stage of labour; the infant had a marked bradycardia and there was gross meconium-staining of the liquor amnii.

In vitro the activity of the monoamine oxidase is greatly reduced at low oxygen

tensions (Kohn, 1937; Thompson and Tickner, 1949); it is therefore possible that *in vivo* the activity of the enzyme will be related to the maternal placental blood flow and that measurement of enzyme concentration alone can give very little information about its functional capacity. It is inferred from clinical observation that the circulation in the pregnant uterus increases with each successive pregnancy for the uterine blood vessels are larger in multiparae than primiparae, and the birth weight of each succeeding child tends to increase (Karn and Penrose, 1951). A larger decidual circulation in multiparae, besides providing a better environment for the foetus, may also provide optimal conditions for the monoamine oxidase and be a factor contributing to the smaller incidence of foetal distress in the multiparous patient (Dumoulin and Martin, 1957) and the immunity of the infants to the hazards of postmaturity (Kloosterman, 1956).

As pregnancy advances the monoamine oxidase concentration in the placenta increases in both the human and in the rat (Thompson, 1950). It has also been found in the guinea-pig that, as pregnancy advances, the maternal placental circulation becomes more sensitive to the action of sympathomimetic amines and other pressor substances (Martin and Young, 1958). Nothing is known of the response of the human uterine circulation to these substances during pregnancy. During normal labour Garcia and Garcia (1955) were unable to find measurable amounts of epinephrine-like substances in the blood stream and Gemzell, Robbe and Ström (1956) did not observe an increase in the renal excretion of sympathomimetic amines, although in two cases with post-partum haemorrhage an increased excretion was found. In painful and inert labours, epinephrine-like substances are readily demonstrable in the plasma (Garcia and Garcia, 1955) and these may contribute to the cause of foetal distress, especially if the maternal placental vessels have become sensitized to pressor substances during pregnancy and the optimal oxygen environment of the amine oxidase has not been maintained during labour.

Summary

(1) Monoamine oxidase concentration varied widely in the 33 term placentas studied and in those from 20 postmature deliveries; 31 of the placentae were from primiparous mothers and 22 from multiparous patients.

(2) There was no significant difference in placental monoamine oxidase concentration as between term and postmature deliveries or between primiparous and multiparous patients.

(3) In 6 of the 53 patients studied, there was clinical foetal distress; the concentration of monoamine oxidase in the placentae of these cases was not significantly different from that in the placentae of babies which were not distressed.

(4) The low placental monoamine oxidase content *per se* would therefore not appear to be a common factor contributing to the increased incidence of foetal distress in primiparous and postmature patients. Other contributory factors are discussed.

Acknowledgments

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DELIVERY OF THORACOPAGUS TWINS AFTER INTRA-UTERINE SEPARATION

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WITH

SOME ANATOMICAL DETAILS OF THE MONSTER

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CONJOINED twins are rare. The diagnosis is rarely made before labour, and most commonly the problem is recognized when obstruction to delivery in the second stage is encountered. The diversity of form, size and presentation is such that the accoucheur will seldom have a ready formula for managing the eventuality, and under such circumstances may well elect to proceed along a course which leads him into further difficulty, each step committing him more irrevocably to the form of delivery on which he has embarked.

Having encountered a thoracopagus which was diagnosed in the second stage, but before forceful attempts to deliver had committed us to any particular line of action, and the elected management having proved relatively easy and successful, we publish the case in the hope that some other obstetrician, faced with a similar situation, may to a small extent, be forearmed.

Because advances in surgery now offer a proportion of these monsters a prospect of reasonable and separate existence, the patterns of anatomical fusion and developmental abnormality encountered are of some considerable interest and importance. Accordingly we include an anatomical study of this thoracopagus.

CASE HISTORY

The patient, aged 32 years, was referred to the antenatal clinic on 3rd December, 1954, because her family doctor was unable confidently to define the presentation of the foetus, which he thought was a breech. She had suffered "gradually increasing bilateral oedema of the ankles, pitting for 14 days", and recently her blood pressure had risen to 140/90, without albuminuria. Otherwise she had been well throughout pregnancy. Her last menstrual period had started on 17th April, 1954 and the gestation was at 33 weeks, her estimated date of delivery being 23rd January, 1955.

Her only confinement, two years previously had entailed an 11-hour labour at term after an uneventful pregnancy, with spontaneous delivery of a normal male infant weighing 9¼ pounds. There had been no miscarriages. Her blood group was B, Rhesus positive; haemoglobin 71 per cent. Her medical history told of tonsillectomy and infective hepatitis.

On examination her girth at the umbilicus was found to be 39 inches. The presentation was thought to be a breech and one foetal heart could be heard. There was no hydramnios. Nonetheless the possibility of twins was considered and X-ray examination arranged. The presence of oedema was confirmed, the blood pressure was 140/90, and neither sugar nor albumin was found in

the urine. The patient was advised to rest and to attend again in a week for further advice in the light of the radiological findings.

The following day she was admitted to the maternity unit of another hospital as an emergency, with vomiting and pain in the epigastrium. Her state was much as recorded on the previous day. Her symptoms were not severe and resolved with bed rest and glucose. A vaginal examination revealed a cervix not effaced and 1 cm. dilated, with membranes bulging and a foot palpable within. The uterus was thought to contain twins both presenting by the breech, and a foetal heart was audible in the right flank. The patient told of an X-ray taken the previous day. A telephoned description by a radiographer indicated twins presenting by the breech.

Labour commenced on 5th December at 7.0 p.m. At 12.15 a.m. on the following day labour was well established, the cervix half dilated, the membranes intact and a foot presenting. The foetal heart rate was 146 per minute. An injection of 150 mg. of Pethidine was given. At 4.20 a.m. the foetal heart could not be heard, nor was it heard thereafter. A further 150 mg. of Pethidine was given by injection.

At 6.20 a.m. the cervix was fully dilated and the membranes ruptured. An hour later, despite good expulsive efforts, there was no progress. At 7.30 a.m. vaginal examination revealed one foot at the vulva, a second and opposite foot just within the introitus, and a third foot high in the vagina. It was thought that both twins were trying to engage at the same time, and thereby causing obstruction. There was no membrane intervening between the first pair of legs and the third foot, but this finding was not at the time regarded as significant.

At 7.40 a.m. a general anaesthetic was administered. With the patient's legs on lithotomy rods, and a full aseptic ritual, the third and highest foetal leg was returned to the uterus and an attempt made to deliver the leading twin by leg traction. The attempt, while not forceful, was ineffective. The breech could be made to enter the brim but thereafter firm resistance to further progress was encountered.

At this stage a thorough intra-uterine examination was carried out to define the nature of the obstruction. A contraction ring was suspected but not found. On passing a hand up the ventrum of the leading foetus it became evident that it was joined in the upper part of the trunk to its twin. Further examination defined the nature of the junction quite clearly. It extended from the umbilicus to the upper sternum, and laterally on each side, nearly to the nipple line. The attachment was firm, included skeletal elements, and prohibited any "shearing" between the foetuses.

The merits of Caesarean section were considered. But the operation would certainly have had to be of the classical type and would have entailed a large uterine incision. No attempt to deliver the foetuses synchronously in parallel was made as it was thought that even in the generous pelvis available, obstruction would be encountered. Accordingly, the foetuses being already dead, it was decided to separate them *in utero* and deliver them by the breech in succession.

One hand was again introduced into the uterus to the area of junction at the umbilicus. A pair of long-handled short-bladed embryotomy scissors was then introduced, the blades following the forearm and wrist until they reached the fingers of the examining hand. When the blades had attained their destination, the handles had entered the vagina and could not be operated. Traction by one of us on the legs of the leading foetus, however, brought the junctional area low enough to be within the scope of the blades while the handles were still available at the perineum.

With the blades kept constantly opposed to the fingers of the intra-uterine hand, separation by cutting was commenced at the umbilicus and proceeded up each side of the fused area slowly until the cephalic extremity of the junctional tissue was reached. Continuing descent of the leading foetus, effected by traction, rendered unnecessary further advance of the scissors. At no time was one in the least doubt as to what tissue was being cut or the safety of the procedure.

The attachment having been divided, the leading foetus was extracted by the breech, whereafter the other (the right) foetus was recovered likewise.

After manual removal of a large placenta the uterine wall and cervix were carefully examined for lacerations. None were found. The total blood loss was 20 ounces. The perineum was intact.

Examination of the foetuses showed them both to be female and weighing 3 pounds 12 ounces and 3 pounds respectively. The line of section was a little ragged at the umbilicus, but thereafter followed the line of junction of the ventral ends of the ribs very closely. (Further details are given below.)

Inspection of the placenta revealed the insertion of a single umbilical cord near the middle. There was one amniotic sac.

On the evening of the first day, twelve hours after delivery, the patient was apyrexial with a pulse rate of 64 per minute. The puerperium remained apyrexial and uncomplicated. She was discharged home on the sixth day. Subsequently she underwent a normal pregnancy and labour, giving birth to a normal child.

Discussion

It is only rarely that a diagnosis of conjoined twins is made before labour. In this case the possibility of multiple pregnancy was considered and an X-ray examination carried out, but the plate was not available for our inspection prior to delivery. Retrospectively we feel that a tentative diagnosis could have been made on examination of the plate. Gray, Nix and Wallace (1950) suggest the following criteria as affording radiological evidence of conjoined twins: (*a*) the heads are at the same level and plane, (*b*) there is unusual backward flexion of the spines, (*c*) there is unusual proximity of the

spines, (*d*) there is no change in the relative positions after movement, manipulation and time.

Although in this X-ray picture the heads were not at exactly the same level in the maternal abdomen, they were at the same level in respect of the foetal axes which were slightly oblique. There was undoubted backward flexion of the spines, and an appearance suggesting close proximity of the lower cervical and upper thoracic vertebral columns, although in a single non-stereoscopic picture this feature is impossible to assess with certainty.

Undoubtedly a further picture was indicated, when the fourth prerequisite, namely an unaltered relationship between the foetuses, should have been manifest and confirmed the diagnosis. There was no incontrovertible evidence of bony union, because the junctional zone lay in front of the shadows of the maternal spine. But this evidence is very seldom present on X-ray examination of ventral thoracopagi because such skeletal fusion as exists is, at this stage, cartilaginous.

As the nature of the case was not discovered by antenatal radiological examination, no further occasion presented itself for the establishment of a correct diagnosis until labour failed to progress in the second stage, when examination revealed the presence of the feet of both foetuses in the vagina. Retrospectively it was realized that there was no membrane intervening between the two sets of foetal extremities. Had the possible significance of this finding been considered at the time it should have brought to mind the possibility of conjoined twins, and have indicated the need for a full intra-uterine examination before reposition of the foot of the second foetus was undertaken and an attempt made to extract the leading twin. Of course, it might have been due to synchronous rupture of both sacs, or the uncommon presence of mono-amniotic twins. However, the attempt at extraction was not forceful and the subsequent management of the case was not compromised thereby. Mahfouz (1949) states in respect of conjoined twins: "Most accidents occur from attempts at forcible extraction of the child without careful and correct recognition of the difficulties present, or from the application of hasty methods of treatment."

Once the diagnosis had been established there seemed to be but three possible courses open, namely, Caesarean section, synchronous delivery in parallel, and intra-uterine separation. At the time it was not realized that delivery in parallel of the breeches, with the posterior head engaging next and the anterior head following, might have succeeded. Foster (1948) delivered thus a thoracopagus weighing 5 pounds 10 ounces at 32 weeks. (This was preceded by a single female triplet.) Siegel (1950) delivered one likewise at 28 weeks (weight not stated). Feeney and Devlin (1954) delivered in this way a 39-week monster weighing 8¼ pounds, but it was not of exactly the same type as our case, for although a dicephalic abdomino-thoracopagus it possessed only three arms and three legs and one may presume therefore that it was less broad at the pectoral and pelvic girdles than would otherwise have been the case. It may be that our case could have been delivered in this way. The disadvantage of an attempt to follow this course is clearly, that if one's judgment is wrong and dystocia forbids further progress, the difficulties encountered are increased and no alternative then remains but to resort to embryotomy rendered hazardous by the cramped conditions prevailing when two foetal bodies are impacted in the pelvis.

The treatment adopted, of intra-uterine separation, appears to be an uncommon one. Smellie (quoted by Chassar Moir, 1956) recommended it for cases where the connecting band was not too solid. Mahfouz (1949) describes it as difficult and extremely risky to the mother unless the band of union is small and soft. To us, however, with this relatively small monster, it did not appear an unduly difficult procedure despite the extent of the union and the involvement of skeletal elements. Its feasibility and success undoubtedly depend on a conclusive preliminary examination of the union excluding spinal, pelvic or cephalic fusion of such bony content that scissors could not divide it, and the freedom to operate as provided by the absence of a foetus impacted in the pelvis by previous forceful attempts to deliver. Given these prerequisites we feel that a monster of considerably larger size could have been dealt with in this way.

Graber (1945) encountered a thoracopagus similar to ours, but at 39 weeks, and separated the partners with a Jacobson hook. The monster weighed 10 pounds 6 ounces and the subsequent delivery was greatly hindered by the development of a contraction ring. But the separation was not undertaken until attempts had been made to "bring both down together, forcing the head of one into the concavity of the neck of the other".

Finally it must be acknowledged that our problem was made easier by the monster being dead at the time that a decision regarding embryotomy had to be made. To what extent that decision would have, or should have, been affected by considerations for the future of the monster, either united or separated, had it been alive, we prefer not to discuss. But we can find no record of a thoracopagus, with the degree of skeletal union identified in this case, undergoing successful surgical separation after birth.

Summary

A case of conjoined twins is reported. Although the presence of twins was recognized before labour, the fact that these twins were conjoined was not recognized until progress ceased in the second stage. They were delivered by scissor separation *in utero* with subsequent serial breech extraction. They were dead before this operation was undertaken.

Consideration is given to the matter of the diagnosis of conjoined twins, and other ways in which this case might have been managed.

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ANATOMICAL REPORT

Interest in the anatomy of human duplicitas has been stimulated by rapid advances in modern causal embryology (Needham, 1942; Waddington, 1956), and by the occasional possibility of successful surgical intervention (Aird, 1954). Isolated anatomical reports are of limited value, most interest being derived from a comparative treatment of all the available information. Reviews of the relevant literature are to be found in the writings of Hirst and Piersol (1892), Schwalbe (1907), Ysander (1924), Rawlings and Warwick (1951), and Aird (1954).

Many forms of classification of double monsters have been proposed, e.g., Fisher (1868), Ahlfeld (1880), and Schwalbe (1907). In the absence of a more fundamental classification in terms of causal morphogenetic analysis, the modification by Hirst and Piersol (1892) of the scheme first proposed by Geoffroy Saint-Hilaire (1832) has been most widely adopted. Following Hirst and Piersol, the present specimen is placed in the sub-group omphalopagus of the anakatadidyma. More specifically the term abdomino-thoracopagus is acceptable. Perhaps the most interesting feature of the specimen concerns the complex united heart. Previous accounts of the cardiac anomalies found in certain cases of conjoined twinning are given in the extensive monograph of Ysander (1924) and in the publications of Mudaliar (1930), Shaw, Brumbaugh and Novey (1934), Forbes (1938), Mortimer, Kirshbaum and Fields (1941), and Aird (1954).

At the time of separation one of the twins had retained the major portion of a common fused liver and a common fused heart. In the following descriptions this specimen will be termed twin "A", and the second, twin "B".

A symmetrical fusion had been present, involving the upper three-quarters of the ventral abdominal walls and also a large area of the ventral thoracic walls. In the thoracic region there was fusion of the cartilaginous sternal plates and also of the cartilaginous ventral extremities of the costal elements, up to and including the third costal cartilage. This fusion involved the whole thickness of the abdominal and thoracic walls, and along the margin of the abdominal communication there was continuity of the parietal peritoneum of the foetuses resulting in a common peritoneal cavity. Similar continuity of the parietal pericardium existed in the thoracic region. Smaller communications existed between the pleural cavities of the foetuses, but in each case the diaphragm was complete. Unfortunately, owing to the surgical separation it was impossible to determine details of the junctional diaphragmatic zone. A short description of each of the systems is given.

Skeletal System. Antero-posterior and lateral radiographs of the specimens showed that skeletal development had proceeded normally except for the absence of ossification in the manubrium sterni and in the sternal plates.

Respiratory System. The larynx, trachea, bronchi and lungs appeared normal in both cases.

Alimentary System. The intestinal tracts of the specimens were separate and had developed normally. In each case there was a well-developed foetal type appendix, and the pancreas and spleen appeared normal.

Massive fusion was present between the liver of A and B, the fusion being so complete that it was impossible to determine the portion referable to either twin. Large vascular channels communicating the two foetuses existed at this point, but unfortunately damage occurring at the time of separation had obscured the details of the peritoneal relationships of the liver, and the umbilical vascular system. The gall bladder was absent in each case, but a patent bile duct was present in each specimen, terminating normally in the duodenum.

Cardiovascular System. The heart and great vessels were highly abnormal as widespread fusion was present in the atrial and also in the ventricular region.

One large partially subdivided atrial cavity, common to foetus A and B was present; the thin wall of this voluminous cavity presenting numerous folds with intervening grooves, arranged in a haphazard fashion and bearing no relationship to any underlying pattern of atrial subdivision. A fenestrated, membranous partition provided an incomplete subdivision of the cavity into portions A and B, and, distinct from this on each side, a few membranous strands were present occupying the positions of definitive inter-atrial septa. Thus, wide communications existed between the circulatory systems at this point. Superficial examination of the ventricular region revealed extensive fusion of the ventricular walls, a shallow groove on the surface indicating the junctional region (Fig. 1). The ventricular cavities of A and B were in fact separate, a thick muscular partition separating the two. The inter-ventricular septa of A and B were also thick and muscular, but each presented a moderately large crescentic

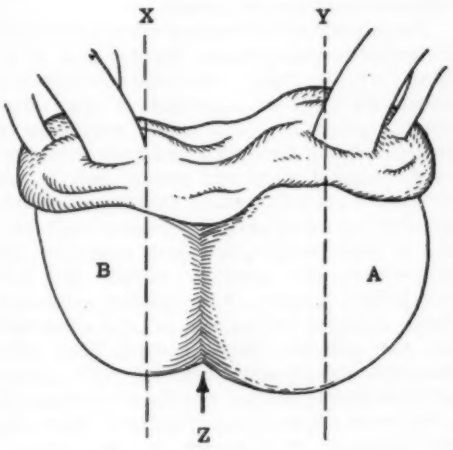

FIG. 1

Lateral view of atrial and ventricular regions. X and Y indicate planes of ventricular section illustrated in Figure 2. Z—surface groove overlying muscular septum between the ventricular regions.

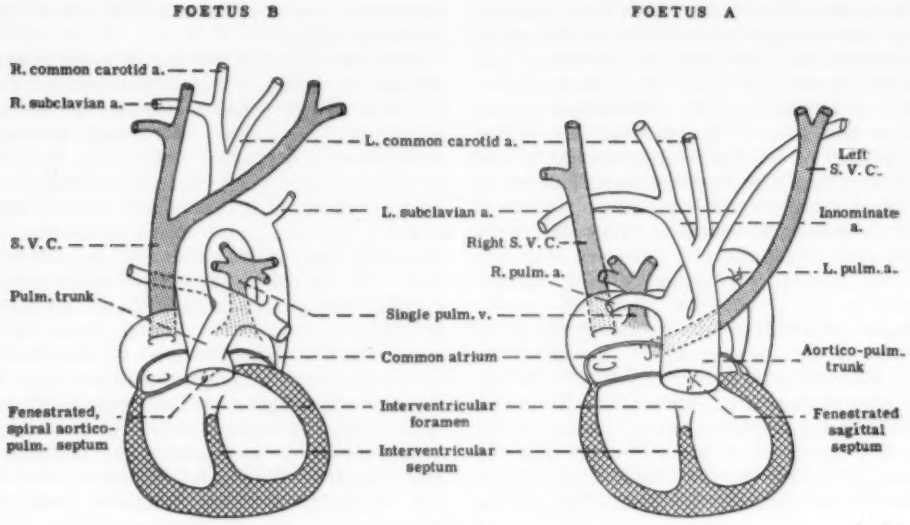

FIG. 2

deficiency in its superior border. The atrio-ventricular valves were represented by a few irregular membranous strands.

The thoracic arterial pattern of twin A showed a number of most unusual features (Fig. 2). A large arterial trunk originated immediately above the anterior extremity of the inter-ventricular septum. The lumen was partially subdivided by a fenestrated membranous septum in the sagittal plane and present only in the proximal 1 cm. of the trunk. Distally, this trunk divided into (*a*) an aortico-pulmonary stem and (*b*) a large vessel which gave origin to the innominate, left common carotid and left subclavian arteries. The aortico-pulmonary trunk occupied the position of, and continued as, the definitive thoracic aorta. The right pulmonary artery arose from the right margin of its ascending portion, and the left pulmonary artery from the concavity of the arch. There was no evidence of septation in the aortico-pulmonary stem. A right and a left superior vena cava of approximately equal size, and a single pulmonary vein formed by the confluence of three veins (1 left, and 2 right), were present in the positions indicated in Figure 2.

The thoracic arterial and venous patterns of twin B showed only a few abnormal features. The innominate artery and the left common carotid artery arose from a common trunk, and a single pulmonary vein (formed by the confluence of the usual four veins) was present. The aortic and pulmonary trunks were normally disposed but were incompletely subdivided by a membranous spiral aortico-pulmonary septum which showed many perforations.

Urogenital System. In each case the kidneys showed the normal foetal lobulation and the ureters, bladder, uterus, uterine tubes and ovaries had developed normally.

ACKNOWLEDGMENT

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FOETAL WASTAGE IN TWIN PREGNANCY

BY

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THE association of twin pregnancy with a high foetal mortality is well recognized. In the literature reviewed, figures of 18·8 per cent (Anderson, 1956), 11 per cent (Bender, 1952), 31 per cent (Guttmacher, 1939), and 11·1 per cent (stillbirths only, McClure, 1937) are quoted. It is also recognized that the most important single factor responsible for this heavy toll of foetal life is prematurity.

What is less widely appreciated by the profession and even denied by various authors is the greater risk of death to the second twin at birth, a disadvantage which appears to arise chiefly, if not entirely, on account of its peculiar and unfavourable after-coming position.

The purpose of this paper is, firstly, to study the overall problem of foetal wastage and, secondly, to suggest a revision of current opinion relating to the management of the second twin.

The present review is based on case records of 408 mothers admitted to the Royal Maternity Hospital, Belfast, during the 10-year period 1947–1956. The large majority of patients belonged to social classes III to V. Of the 816 babies, 3 first twins were born at home and the remaining 813 babies in hospital. There were 51 stillbirths (6·3 per cent) and 49 deaths in the first week of life (6 per cent), making a total foetal loss of 12·3 per cent. This is 60 per cent higher than the hospital figure of 7·7 per cent for all deliveries during the same period (stillbirths 5 per cent and neonatal deaths 2·7 per cent).

TABLE I

Causes of Stillbirth

	Twin 1	Twin 2	Total
A. Ante-partum Factors:			
Pre-eclampsia	8	5	13
Foetal deformity	3	4	7
Hydramnios	1	4	5
Foetus papyraceus	1	1	2
Erythroblastosis foetalis	0	1	1
Essential hypertension	0	1	1
Unknown	2	2	4
	15	18	33
B. Labour Hazards:			
Prolapse of the cord	4	2	6
Intra-partum asphyxia, unexplained	2	3	5
Difficult breech delivery, asphyxia	0	2	2
Vasa praevia	1	0	1
Separation of placenta	0	1	1
Extreme moulding, intracranial haemorrhage	1 (C/S)	0	1
High forceps delivery, intracranial haemorrhage	0	1	1
Locked twins, decapitation	1	0	1
	9	9	18

Foetal Wastage

Stillbirths

The stillbirths have been separated into two groups according to the cause (Table I), whether ante-partum or intra-partum. The major ante-partum factors were pre-eclampsia, hydramnios and foetal deformity, which together accounted for 25 of the 33 stillbirths. There were 4 macerated stillbirths in which the cause of death was unknown.

Labour hazards were responsible for 18 intra-partum stillbirths, 9 first and 9 second twins. The immediate risks of death in labour appear to be equally shared. It will be shown that the delayed and less obvious hazards of labour causing neonatal death take a disproportionately higher toll of second twins. Two of the complications listed are probably more hazardous to the first twin, namely, prolapse of the cord and locking of twins. The former caused 6 stillbirths, 4 in first twins but only 2 in second twins. The explanation lies in the degree of cervical dilatation at the time of the accident: in the first twin the cord is likely to prolapse before full cervical dilatation, whereas, in the second twin, the cervix is fully dilated, permitting immediate treatment. Locking of twins is exceedingly rare, and unless recognized and treated early, the first twin may be lost. There was one intra-partum stillbirth in a first twin due to extreme moulding and intracranial haemorrhage. It was delivered by Caesarean section.

Thirty-two (62·7 per cent) of the 51 stillbirths were premature. Prematurity, although not a direct cause of death, was an important contributory factor.

Neonatal Deaths (Table II)

Forty-nine babies died in the first week of life, the majority within the first 24 hours. Forty (81·6 per cent) were premature, and prematurity was the sole apparent cause of death in 35 cases, the birth weights averaging only 2 pounds 15½ ounces. The most important known precipitating causes of premature labour were hydramnios and pre-eclampsia, but, as may be expected, the "unexplained" cases formed the largest single group of 12 cases.

The most arresting feature, however, was the preponderance of neonatal deaths in second twins, 34 as compared with 15 first twins. The significance of this is discussed in a later section.

Table II

Causes of Neonatal Death (1st Week)

	Twin 1	Twin 2	Total
1. Prematurity (main factor) associated with:			
Hydramnios	5	5	10
Pre-eclampsia	3	6	9
Premature rupture of membranes	1	1	2
Eclampsia	0	1	1
Accidental haemorrhage	1	0	1
Unexplained	2	10	12
2. Pneumonia	0	4	4
3. Erythroblastosis foetalis	1	2	3
4. Asphyxia neonatorum	1	2	3
5. Birth trauma, intracranial haemorrhage	0	2	2
6. Separation of placenta	0	1	1
7. Foetal deformity	1	0	1
	15	34	49

TABLE III
Influence of Maturity

Gestation	Stillbirth (per cent)	Neonatal Deaths (per cent)
36 weeks and under	6·1	11·3
37 weeks and over	6·4	2·8

Some interesting figures were obtained when the series was divided into two groups according to period of gestation (Table III).

The incidence of stillbirth is the same for both groups, which seems to suggest that the hazards of twin pregnancy inflict equal penalty on the foetuses throughout intra-uterine life. Once the baby begins a separate independent existence, prematurity becomes a decisive factor. As can be seen, the neonatal death rate is 4 times higher in those cases where labour occurred before 36 weeks.

Influence of Pre-eclampsia

What influence does pre-eclampsia have on foetal wastage? Bender (1952) in his series of twin pregnancies found that, although the incidence of pre-eclampsia was greatly increased, its severity as reflected in the foetal mortality was not. In fact, those patients with pre-eclampsia had a lower foetal loss (9·7 per cent) than those without (11·4 per cent), because the toxaemic condition tended to develop in the later weeks of the third trimester, when prematurity was no longer a serious problem. These findings were largely confirmed in the present series. Those cases with pre-eclampsia had a foetal mortality of 9·9 per cent (5·6 per cent stillbirths, 4·3 per cent neonatal deaths) compared with 12·3 per cent for all cases.

Influence of Hydramnios

Hydramnios is a frequent complication in twin pregnancy. Forty-six patients (11 per cent), in whom the condition was diagnosed, had 10·9 per cent stillbirths and 12 per cent neonatal deaths, a total foetal loss of 22·9 per cent. This is almost double the overall mortality of 12·3 per cent, and closely approximates to the figures obtained by Bender (1952).

Influence of Parity

There does not appear to have been any enquiry into the effect of parity on twin pregnancy. Table IV shows that primigravidae, as anticipated, developed pre-eclampsia more frequently than multiparae and were also more likely to come into labour before 36 weeks. These unfavourable tendencies were reflected in the higher foetal mortality.

TABLE IV
Influence of Parity

	Primigravidae (per cent)	Multiparae (per cent)
Pre-eclampsia incidence ..	58·9	40·4
Maturity 36 weeks or less ..	57·1	32·0
Foetal mortality	14·2	10·8

Risks of Second Twin

Opinion is divided on this controversial subject. The majority, notably Potter and Crunden (1941), Bender (1952) and the textbook authors maintain that labour does not involve extra risks for the second twin. The opposite view is held by C. Scott Russell (1952), Kurtz, Keating and Loftus (1955) and Macafee (1958). Kurtz *et al.* found that foetal loss in premature twins was 12·4 per cent for the first and 20·6 per cent for the second. Munnell and Taylor (1946) noted a higher death rate for the second twin, which they attributed to the higher frequency of assisted delivery.

Of the 100 foetal deaths in this series, no less than 61 were among second twins (see Tables I and II). If only those deaths due to labour hazards are considered (Table V), an even more

TABLE V
Risks of Second Twin

Stillbirths and Neonatal Deaths	First Twin	Second Twin
Asphyxia	3	5
Birth trauma (excluding locked twins)	0	5
Pneumonia	0	4
Separation of placenta	0	2
	3	16

striking difference is demonstrated. This increased susceptibility of the second twin to labour hazards is supported by the findings of other investigators (C. S. Russell, 1952; Anderson, 1956).

Birth Trauma from Assisted Delivery

It is well known that malpresentation is far more common in second twins. In this series it occurred in 108 first twins and 164 second twins. It follows that operative delivery is required more frequently in the second twin. Consequently, the second twin is exposed to a greater risk of birth trauma (C. S. Russell, 1952; Anderson, 1956). The actual damage inflicted would vary inversely as the operators' skill and experience. The expert may eliminate completely the incidence of foetal injury, but he cannot remove the potential risks present: they will remain a danger to the after-coming twin as long as both twins cannot escape from the uterus simultaneously.

TABLE VI
Method of Delivery

	First Twin		Second Twin	
		Per cent		Per cent
Normal delivery	209	51·2	137	33·5
Assisted breech	70		88	
Breech extraction	35	44·3	53	62·0
Internal version, breech extraction	2		35	
Forceps delivery	74		77	
Caesarean section	16		17	
Unknown	2		3	

The frequency of operative vaginal delivery (Table VI) in the second twin (62 per cent) was 40 per cent higher than that of the first twin (44·3 per cent). This agrees with the experience of other authors (Munnell and Taylor, 1946; Kurtz, Keating and Loftus, 1955). It is therefore not surprising that all the 5 deaths from traumatic vaginal delivery (excluding one case of locked twins) were in the second twin (Table V).

Circulatory and Respiratory Embarrassment

With the delivery of the first twin, the uterine volume shrinks very considerably within a matter of minutes. It is not difficult to imagine the embarrassment such a drastic event may cause to the utero-placental circulation, and one wonders why separation of the placenta and foetal anoxia do not occur more frequently. These dangers are no mere theoretical threats to the life of the second twin. Premature separation of the placenta was mentioned by J. K. Russell (1952) and Anderson (1956). It was encountered twice in this series. The anoxic foetus may die, or make untimely respiratory efforts *in utero* resulting in death from pneumonia in the early neonatal period. The 4 cases of pneumonia all succumbed within the first two or three days.

TABLE VII
Foetal Death in Twins

	First Twin	Second Twin
Potter and Crunden (1941)	37	55
Munnell and Taylor (1946)	9	16
Potter and Fuller (1949)	35	46
Bender (1952)	45	59
J. K. Russell (1952)	5	11
Kurtz, Keating and Loftus (1955)	35	62
Stone and Donnenfeld (1956)	26	30
Weir (1957)	28	40
Anderson (1958)	58	83
Present series (1958)	39	61
	317	463

Table VII shows the figures for foetal deaths published by other writers. The fact that the figure for the second twin in every instance is higher than the corresponding one for the first twin is highly significant. Can this be attributed to prematurity? In this series, the average birth weight among the premature neonatal deaths was 2 pounds 15 ounces for the first twin and 3 pounds 3¼ ounces for the second, a difference of 4¼ ounces in favour of the second twin. Prematurity, therefore, cannot be accepted as the cause of more deaths among second twins.

More confirmatory evidence of second twin risks is given in Table VIII which is based on 578 sets of twins delivered in Belfast during 1951–1955. Second twin mortality is 71 per cent higher than that of the first.

TABLE VIII
Foetal Death in Twins
(Belfast 1951–1955)

	First Twin	Second Twin
Stillbirth rate	38·1	58·8
Neonatal death rate	64·7	117·6

REDUCING FOETAL WASTAGE

Diagnosis

In the articles studied, it is surprising how large a proportion of cases were not diagnosed until labour started. The percentage diagnosed antenatally varies from less than 50 per cent (Stone and Donnenfeld, 1956) to 64·4 per cent (Guttmacher, 1939). In the present series 80 per cent of cases were diagnosed before onset of labour. This degree of accuracy is probably due to the fact that all new antenatal patients in this hospital are seen at the first visit by a consultant or experienced registrar, and shows the importance of this practice.

Antenatal Care

The importance of adequate supervision in the antenatal period must be strongly emphasized as there is an increased incidence of antenatal complications in twin pregnancy (Table IX), particularly pre-eclampsia and hydramnios, factors which predispose to prematurity.

TABLE IX
Antenatal Complications

	Cases	Percentage
Pre-eclampsia*	196	48·0
Anaemia	75	18·4
Hydramnios	45	11·0
Accidental haemorrhage ..	11	2·7
Hyperemesis	11	2·7
Hypertension	9	2·25
Cardiac disease	7	1·75
Eclampsia	6	1·5
Placenta praevia	3	0·75

* The criteria for pre-eclampsia were:
(*a*) Mild: blood pressure of 140/90 mm. mercury with albuminuria or oedema.
(*b*) Severe: blood pressure of 160/110 mm. mercury with gross albuminuria (+++) or marked oedema.

As can be seen in Table IX the incidence of pre-eclampsia was 48 per cent, i.e., more than 2½ times the overall hospital figure (18 per cent) for the same period. Bender (1952), using as his sole criterion a blood pressure of 140/90 mm. mercury, found a 24 per cent incidence of pre-eclampsia as compared with 6·4 per cent for singletons. Other reported figures vary from 29·6 per cent (Hawker and Allen, 1949) to 40 per cent (McClure, 1937). Primigravidae, as shown earlier, are specially liable to develop pre-eclampsia (58·9 per cent).

TABLE X
Benefits of Antenatal Care
(Percentages in brackets)

	Booked	Non-Booked
Mild pre-eclampsia	85 (36·3)	59 (33·9)
Severe pre-eclampsia ..	18 (7·7)	34 (19·5)
Maturity 36 weeks or less ..	78 (33·3)	95 (54·6)
Vertex-vertex presentation ..	114 (48·7)	63 (36·2)

Benefits of Antenatal Care

When booked cases are compared with non-booked ones (Table X), it appears that antenatal care has conferred on the former group these benefits:

(a) *Lower Incidence of Severe Pre-eclampsia.* Comparable figures for mild pre-eclampsia were obtained for both groups, whereas severe pre-eclampsia was 2½ times more frequent in non-booked cases. This suggests that while antenatal care may not have reduced the incidence of mild pre-eclampsia, it certainly was effective in preventing the widespread development of severe forms. Of the 196 cases of pre-eclampsia, 77 (39·3 per cent) required surgical induction of labour.

(b) *Less Premature Deliveries.* Cases receiving efficient antenatal care are less likely to come into labour before 36 weeks. Thus, gross prematurity may be prevented. This contention is further supported by the figures given under "Bed Rest".

(c) *More Normal Presentations.* This claim would not appear to be unjustifiable if it is remembered that the likelihood of spontaneous version increases with foetal maturity. The frequency of the various presentations conforms

to those published in textbooks. Both foetuses presented by the vertex in 177 patients (43·3 per cent). This combination occurred in 48·7 per cent of booked cases but only 36·2 per cent of non-booked ones, presumably due to the higher proportion of more mature pregnancies among booked cases and hence a greater number of spontaneous versions.

Bed Rest

The effectiveness of bed rest in prolonging pregnancy was first assessed by Bender (1952), who showed that 71·6 per cent of patients admitted to hospital for rest reached 38-weeks gestation, while only 61·4 per cent of those not admitted managed to do so. Anderson (1956) states that in his cases bed rest also appeared to prolong pregnancy. These findings are amply supported by the present series. Among those patients who had bed rest in hospital for 7 days or more, 71·3 per cent of booked cases and 59·1 per cent of non-booked cases reached 37 weeks. Of those patients who had no hospital stay at all, 51·5 per cent of booked cases and 37 per cent of non-booked cases attained the same maturity. Thirty-one patients exceeded 40 weeks and, of these, no fewer than 27 (87 per cent) had hospital rest, the average length of stay being 5·4 weeks.

From the foregoing observations, one may conclude that efficient antenatal care and supervised bed rest are the two most potent weapons against prematurity.

Admission to Hospital for Rest

When should patients be admitted to hospital for rest? In the presence of complications such as pre-eclampsia and hydramnios, even of a mild degree, early admission is obligatory. But the uncomplicated cases present a somewhat different problem for various reasons. There is no universal agreement on the optimum time to commence bed rest. In the literature consulted, the time for routine admission into hospital is variously advised: in the 30th week (Russell, 1952), not later than 32nd week (Anderson, 1956), 33rd week (Bender, 1952), 30th to 34th week (Donald, 1955) and from the 36th week (MacLennan, Wrigley and Percival, 1955). The patient herself may fail to see the need for hospitalization. One has also to consider the economic aspect as the cost per antenatal patient is extremely high. Therefore, there must be good reasons for the admission of all patients, and the following figures would justify the scheme suggested below.

Of the 408 patients in the series, 135 (33 per cent) went into spontaneous labour before the 37th week. Of these 135 cases, 129 (96 per cent) were delivered between 30 and 36 weeks. It would defeat our purpose, therefore, to advocate admission in the last few weeks of pregnancy, as the great majority of very premature spontaneous labours would have occurred before then, while those cases admitted would be relatively mature and would be less able to benefit than those admitted earlier on.

The logical conclusion is that, if hospital stay is to benefit the largest number of deserving mothers, admission at 30 weeks should be the rule. Should bed shortage or domestic responsibilities be a problem, it is probably wiser to keep patients in hospital from 30 to 36 weeks than from 36 weeks onwards. Even if they have to be discharged after the 36th week, the benefit gained would be well worth while. The extra 6-weeks maturity would greatly improve the chances of foetal survival and the hospital regime should enable the patient to look after herself at home more intelligently.

This policy appears to be sound and certainly its value should be assessed.

Management of Delivery

Enough has been said about the potential labour hazards and the frequent need for operative intervention. In this series, only one-third of the mothers delivered both babies spontaneously (Table VI). All the others required the services of an experienced obstetrician and in most instances also of a competent anaesthetist. For this one reason alone, all twin deliveries should be conducted in hospital; this agrees with the advice given by J. K. Russell (1952). In multiple pregnancy there are serious threats to maternal life such as eclampsia and post-partum haemorrhage, on which all textbooks lay great stress but the obvious need for institutional confinement is barely mentioned.

The duration of labour is generally believed to be prolonged. The average duration for primiparae in this series was 18·75 hours compared with that for all primiparae delivered in this hospital of 16·9 hours. There were 12 patients (2·9 per cent) who laboured for more than 48 hours. The overall hospital figure was 1·4 per cent. Labour lasted more than 24 hours in 10·3 per cent, closely corresponding with Bender's figure of 11 per cent. It may be concluded that there is only a small increase in the incidence of prolonged labour.

Method of Delivery—First Twin

This is amply dealt with in textbooks and needs no elaboration. Suffice it here to stress the vital importance of gentleness and skill in delivering either twin. Forceful and amateurish efforts may well prove fatal to the premature twin.

Delivery of the Second Twin

Again, this subject is fully discussed in textbooks, although not all authorities are agreed on any single line of management. However, there is one common note of caution, calling for vigilance and non-interference in the absence of complications. There is some difference of opinion as to how soon after the first delivery steps should be taken to effect the second. MacLennan, Wrigley and Percival (1955) in *British Obstetric Practice* state that "as the interval has been shown to be thirty minutes or less in over 85 per cent of cases by Bender (1952) the membranes should not be ruptured at least until that time has elapsed". Moir (1956) advocates an interval of 10–20 minutes before interfering, while Greenhill (1951) thinks that it is safe to wait up to 60 minutes. In this school, Macafee favours rupture of the membranes within 10 minutes of the birth of the first twin, if they have not already ruptured, and proceeding with delivery of the second baby.

Prompt delivery is also advised by Stone and Donnenfeld (1956) and Kurtz, Keating and Loftus (1955). The latter authors, correlating the interval between deliveries for babies over 1,500 g. with the death rate, obtained the following figures:

	Mortality Per cent
Delivery under 5 minutes ..	6·6
6–10 minutes	3·2
11–15 minutes	8·7
Over 16 minutes	10·0

The optimum time for delivery was between 6 and 10 minutes.

In this series the average time lapse was 16·8 minutes. A study of individual cases of fresh stillbirth due to intra-partum asphyxia revealed 4 cases where no explanation could be found other than delay in delivery, the intervals being 30, 40, 120 and 240 minutes after the birth of the first twin. In the last 2 cases the first twins had been born at home.

Donald (1955) says: "It has to be remembered that the second twin, as long as it remains *in utero* after the first twin has been expelled, continues at risk due to reduction in utero-placental circulation." It seems expedient, therefore, while the cervix is still fully dilated immediately following the first delivery, to rupture the membranes and deliver the second twin from a potentially dangerous situation.

Conclusions

Prematurity is the major factor responsible for the high foetal mortality in twin pregnancy. Additional antenatal care and admission to hospital at 30 weeks appear likely to reduce the incidence of prematurity and therefore perinatal mortality. While the figure of 12·3 per cent in this review is high, it compares favourably with the best results reported in other series.

Whereas it is widely acknowledged that the birth of one twin is likely to affect adversely the survival of the second foetus, the evidence from this investigation indicates that disturbed utero-placental circulation associated with delay, and trauma attending operative delivery, are the two major factors contributing to the high death rate. Skilful and prompt delivery are suggested as the remedy to the problem.

The majority of twin pregnancies require some form of operative assistance at delivery, often with the aid of anaesthesia. In order to meet this need for specialized attention, insti-

tutional confinement of all twin pregnancies is advocated.

Summary

(1) A foetal mortality of 12·3 per cent is demonstrated among a series of 408 consecutive twin pregnancies.

(2) Antenatal, intranatal and postnatal risks of twin pregnancy, in large measure associated with gross prematurity, contribute to this high mortality.

(3) Antenatal care and bed rest in hospital are shown to confer striking benefits in reducing maternal complications and prolonging gestation, thus leading to a reduction in prematurity and foetal wastage.

(4) Early attendance by pregnant women, accurate diagnosis and careful antenatal supervision are essential. In order to prevent onset of very premature labour, bed rest in hospital from the 30th week is suggested.

(5) Only one-third of the patients delivered both babies spontaneously. The need for operative assistance in the remaining two-thirds makes it imperative for all twin pregnancies to be confined in hospital.

(6) The second twin is specially susceptible to perinatal death on account of labour hazards arising from malpresentation and disturbed utero-placental circulation following the birth of the first twin.

(7) In order to reduce the risk of such death, rupture of the membranes within 10 minutes followed by prompt and skilled delivery is advocated.

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FOETAL ABNORMALITY IN TWINS WITH AN UNUSUAL PRESENTATION CAUSING DYSTOCIA

A Comment on the Obstetrical Management and Possible Causation

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ALTHOUGH there is a high incidence of foetal abnormality associated with twin pregnancy, this case is described because of its unusual obstetrical features. The possibility that the foetal malformation was caused by diagnostic X-rays is also discussed.

CASE RECORD

Past History

The patient, Mrs. M.N., Case No. 80/58, was aged 22, and this was her first pregnancy. She had suffered from chicken-pox, rubella and mumps, in childhood.

A miniature chest X-ray in January, 1957, revealed pulmonary tuberculosis affecting the apex of the right lung. Subsequently, in April, 1957 a right upper pulmonary lobectomy was performed, and in May, 1957 she had a corrective thoracoplasty at a civilian thoracic unit.

In the four months from February to June, 1957, 18 postero-anterior X-rays of the chest were performed. Pre-operatively, bilateral tomographs and bronchography were carried out. The final chest X-ray on 17th January, 1958, indicated a satisfactory post-operative result. She had not had any other significant illness. There was no past history of foetal abnormality in the patient's or her husband's family.

Present Pregnancy

She was first seen by us at the antenatal clinic on 26th March, 1958, 20 weeks after her last menstrual period which had commenced on 3rd November, 1957. Her expected date of confinement was 10th August, 1958.

Her general condition was satisfactory. The blood pressure was 115/50 millimetres of mercury. Urine examination revealed no abnormality. The haemoglobin was 88 per cent (13 g./100 ml. Haldane), the blood group was B. Rhesus positive. The Wassermann and Kahn tests were negative.

She was seen at regular intervals at the antenatal clinic and remained well. At the 31st week of pregnancy, the presenting part was the breech. The foetus continued to present either as a breech, or as a transverse lie, until the 34th week. She was admitted to hospital on 2nd July, 1958, for external cephalic version. There was no discrepancy between the duration of pregnancy and the height of the uterine fundus. A straight abdominal X-ray, taken prior to this manœuvre, revealed a twin pregnancy. The first twin presented by the breech, the second as a transverse lie. She was advised to rest and was asked to attend the Clinic at weekly intervals. There was no evidence of hydramnios nor sign of pre-eclampsia at any stage of pregnancy.

Labour

She was admitted at 5.0 a.m. on 11th July, 1958, 4 weeks before term with infrequent uterine contractions. The membranes were intact. Both foetal hearts were heard and were regular. She was given ¼ gr. (16 mg.) morphine by intramuscular injection. Labour, however, became established in the evening, the contractions being regular and well sustained, occurring at 5-minute intervals. There was a slight vaginal blood loss. Three gr. (192 mg.) Quinal-barbitone was given orally at 10.0 p.m. She slept for short periods during the night, and rested well between contractions. At 10.0 a.m. on 12th July, 1958, she wished to bear down with her pains. Vaginal examination showed that the cervix was three-quarters dilated, thin and well applied to a bulging bag of forewaters. One hundred mg. pethidine was given intramuscularly as the presenting part remained high. A further injection of 100 mg. pethidine was given at 2.0 p.m. when pains were again severe. Vaginal examination revealed no significant advance. The contractions remained regular at 5-minute intervals.

At 5.30 p.m. abdominal examination revealed the first twin apparently presenting by the breech and well applied to the pelvic brim. Vaginal examination showed that the cervix was almost fully dilated, only a thin anterior lip remaining. There was a tense bag of forewaters through which the presenting part could just be tipped. Pudendal nerve block was performed with 80 ml. of 0·5 per cent lignocaine. The forewaters were artificially ruptured. Foetal small bowel presented through the os and was differentiated from umbilical cord by speculum examination. A large soft tissue mass was felt filling the pelvic brim. Placental tissue was palpated at the margin of the os on the right side. The vaginal blood loss which had been continuous became moderate. A straight-abdominal X-ray was performed. There was very little change from the prenatal film.

Delivery

At 7.30 p.m. the patient was given a general anaesthetic in the operating theatre. Vaginal examination confirmed the presentation of foetal small bowel through the fully dilated os. There was a large soft tissue mass filling the lower uterine segment. No foetal limbs were palpable. Marginal placenta praevia was confirmed. Only one foetal heart was heard and it was assumed that the presenting twin was dead. A classical Caesarean section was performed. The placenta was encountered on the anterior wall of the uterus. The placenta was swept aside and the first baby was delivered with difficulty because the placenta was adherent to its anterior abdominal wall. This baby was stillborn and showed gross developmental abnormalities.

The second twin was delivered after rupturing the second bag of membranes. This baby was alive but had an imperforate anus. The placenta was removed manually. The uterus was repaired and the abdomen was closed in layers.

The second baby showed white asphyxia and survived only 10 minutes in spite of intensive attempts at resuscitation.

Post-Mortem

The Presenting Twin

The head, shoulders, thorax and upper limbs were normal. The whole of the anterior abdominal wall was deficient. The placenta was adherent around the margin of the defect (Fig. 1). The small bowel, large bowel and liver presented through an opening in the placenta which had surrounded the uterine os. A vessel coursed across the membranes from placental tissue to enter the fissure for the umbilical vein in the liver. There was no attempt at formation of an umbilical cord for this foetus. A well-developed umbilical cord was present for the second foetus. There was a large meningomyelocele and the pelvis was almost completely absent although the legs appeared normal. The genital folds appeared as two peduculated outgrowths from the hind end of the foetus. There was no urethra or attempt at sexual differentiation and a cloaca persisted. There was only one kidney which was found in the lower abdomen and it was polycystic.

The Second Foetus

The only abnormality found in this foetus, which was a male, was imperforate anus.

Discussion

Breech transverse is an uncommon combination of presentations in twin pregnancy, the incidence being less than 1 per cent (Munnell and Taylor, 1946). The presentations in this case appeared to be this combination. Although twinning occurs once in 90 pregnancies, binovular twins are the more common, and in Guttmacher's series (1937) only 25·7 per cent were monozygotic. There is a high incidence of foetal abnormality in monozygotic twins. Quigley (1935) in a series of 109 cases had 8 abnormal foetuses. This patient had monozygotic twins. In this case, there was no apparent foetal abnormality seen in the prenatal X-ray film; it is the consensus of opinion among many obstetricians that radiological diagnosis of foetal abnormality is often difficult. Hydramnios is commonly associated with both foetal abnormality and monozygotic twins, but, as has been stated, there was at no time evidence of hydramnios. It was not until labour had progressed almost to full dilatation that any abnormality was suspected. After rupture of the membranes, vaginal examination was suggestive of prolapse of the umbilical cord. As there was no pulsation, speculum examination was carried out, and this proved the true nature of the presenting part. We have not been able to find any recorded case of presentation of the small bowel after a search of the literature. Vaginal examination in the operating theatre confirmed the presence of placenta praevia and also of gross foetal abnormality. Placenta praevia and premature separation of the placenta are common in twin pregnancy (Nesbitt, 1958).

Classical Caesarean section was performed in an attempt to save the second baby which appeared normal on X-ray examination and also to obviate excessive maternal haemorrhage. The presenting foetus had succumbed prior to operation, evidently from separation of placental tissue supplying it, but the second twin was born alive. Hirst (1940) states that, because of a common blood system in monozygotic twins, the death of one foetus *in utero* conduces to the demise of the other. He analyzed the increase in the stillbirth and neonatal death rates in multiple pregnancy and found there were 4 times as many stillbirths as in normal pregnancy and that foetal abnormality accounted for 3·3 per cent.

The unfortunate situation of the placenta and its firm attachment to the presenting foetus, together with its complete separation before delivery of the second twin, must have contributed to the death of that twin. The placenta in this patient's case covered almost the whole anterior wall of the uterus and surrounded the os. Nesbitt states that in twin pregnancy the placenta covers a much wider area than normal. Only 2 cases of complete absence of the umbilical cord have been recorded (Browne and Browne, 1955). Both of these were associated with abnormality of the foetus, as in this case.

Apart from the obstetrical difficulty encountered in this case it is necessary in view of recent published work on the genetic effects of ionizing radiation, to investigate the possibility that X-rays might have been the cause of the abnormality.

It has become apparent that irradiation can cause foetal malformation and in fact twinning can result from it (Hamilton, Boyd and Mossman, 1946). Twinning in monovular species, including man, is regarded by some as an atavistic reversal to a more primitive condition. Monozygotic twins, however, can only occur by either separation of the formative embryonic material of a single fertilized ovum into two masses or the separate establishment of two "organizing centres" in a single formative area. Although many factors are involved in the production of foetal abnormalities, ionizing radiations produce their effects by interfering with the mechanism of gastrulation and "organizer" production, resulting in the establishment of two or more embryonic axes.

The obstructing foetus in this patient's case showed such an unusual abnormality that it is of interest to outline briefly its possible cause. The growth of the umbilical cord and midgut loop is closely related to the body stalk and allanto-enteric diverticulum. In addition, the vessels in the body stalk develop into the paired umbilical arteries and veins. It would seem that the primary tail "organizer" had lost some of its potency and that, therefore, instead of co-ordinating and producing full development of the umbilical cord by mesodermal proliferation, had failed to cause this growth with resultant absence of the cord. Because the primary "organizers" are non-specific in their action and because the cloacal membrane and tail end of the foetus are probably under the control of the tail "organizer", its failure resulted in imperforation of the membrane and disorganization of development of the tail end of the foetus. The second foetus also had an imperforate anus which would suggest some failure of an "organizer" in this region although the umbilical cord was normal.

Needham (1942) has demonstrated that the organizer substances are related chemically to the polycyclic hydrocarbons. Irradiation of these substances could result in chemical changes which might alter their organizing ability.

Murphy (1940) concludes that gross human congenital malformations arise solely from influences which affect the germ cells prior to fertilization. In a study made on the outcome of pregnancy following exposure to the atomic bomb in Nagasaki, it was found that radiation played a considerable part in producing foetal abnormality either by direct foetal irradiation or indirectly on maternal tissues (Yamazaki, Wright and Wright, 1954).

As far as was possible to ascertain in this patient's case, including an enquiry into her husband's family background, there was no previous genetical abnormality. It can be presumed that the mutation in the foetuses was of recent origin and it is suggested that X-rays may have been responsible, for it is possible to simulate genetical abnormalities in lower vertebrates by environmental alterations, including

FIG. 1

Note vessel running over the exomphalos with no true cord formation.

ionizing radiations. These phenocopes act as teratogenic agents in the same manner as abnormal genes, that is, by affecting a process of development. Actual gene destruction or alteration can result from irradiation of the gonads. It is conceivable that X-rays given to the patient prior to conception may have directly influenced the ovum to be fertilized. On the other hand the patient received X-rays during early pregnancy when the separating germ layers during gastrulation could have been affected and before organogenesis was complete. It is suggested by Payling Wright (1954) that conception should be avoided within two months of any ionizing radiation.

Although the abnormal development in this patient's case could have resulted from causes other than ionizing radiations, the fact that she received approximately 1 to 4 roentgens over a short period just prior to and after conception may be significant. Osborn and Smith (1956) have investigated the genetically significant radiation dose from the diagnostic use of X-rays in England and Wales, and conclude that it is not negligible. The dose amounts to 22 per cent of that from natural radiation sources and is possibly much more. Although these workers will not commit themselves as to whether this contributes a definite genetic hazard to the population, the International Commission on Radiological Protection (1956) consider this is not impossible. The Commission stresses that, because of the unsatisfactory data on which judgments on the genetic effects of X-rays are based, coupled with the knowledge that these genetic effects are accumulative and irreversible, every effort should be made to reduce exposure to all types of ionizing radiation. They also state that whole-body irradiation over an indefinite period should not be more than 0·3 roentgens per week.

Carter (1957) states that the mutation ratio is believed to be linearly related to the radiation dose to the germ cells. Although the extent to which natural background radiation exposure has been augmented through modern practices in Great Britain is not known with any accuracy (Medical Research Council, 1956), the additional genetically effective exposure from diagnostic and radiotherapeutic measures in the country is about equal to the natural background radiation. Statistically, this will raise the mutation rate by about one-tenth.

For the above reasons we have ceased to carry out routine chest X-rays in pregnant women, relying on history and clinical findings to elucidate cases of chest disease.

That the genetic effects of ionizing radiations apparently depend on total dose and not on dosage rate does not mean that abnormalities could not occur from ordinary diagnostic procedures.

It is important to realize that "scatter" from ionizing radiations has effects upon structures not directly irradiated (Binks, 1943). This is produced because the incident direct radiation interacts with the atoms in its path, surrenders a portion of its energy, and has its direction modified, i.e., scattered sideways from the beam direction. "Back scatter" from the wall towards which the beam is directed is approximately three times the side scatter.

Although medical radiology must not be unduly hampered and although we present this case as only a possible result of X-rays, we reiterate the words of Lord Adrian in the Committee on Radiological Hazards to Patients . . . "the possible harm to the race must be set against the certain benefit to the individual. We must aim, however, at reducing all unnecessary exposure of the gonads."

Summary and Conclusions

A very unusual case of abnormality in a twin pregnancy is described. We have not been able to find any recorded case in which a human foetus presented by the small bowel. The value of speculum examination in equivocal cases of digital vaginal examination during labour is stressed.

A possible mode of formation of the abnormality is suggested and emphasis is laid on the role of ionizing radiations in this respect.

We present this case because of recent articles published in the journals of radiology on the genetical effects of X-rays. We tentatively suggest careful selection of patients and definite indications for X-ray examinations until the "safe" radiation dose has been worked out by competent authorities.

Acknowledgments

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SECONDARY HABITUAL ABORTION

BY

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THE occurrence of primary habitual abortion is well recognized and documented. The phenomenon of secondary habitual abortion receives much less attention and only a few series have been described, notably by Javert (1957). The reasons for this are probably because the tragedy of being unable to have a child at all is much more likely to bring patients to seek advice. Because of the modern tendency to limit families the actual occurrence of more than two pregnancies is relatively uncommon. In any event if one or two abortions do occur contraceptive methods will probably be employed thereafter. Finally, the idea may be prevalent that the causes of the secondary variety are similar to the primary variety and are, therefore, not treated as a separate entity.

Widespread family limitation has resulted in a lack of knowledge of the natural history of women who conceive at regular intervals throughout their childbearing life, and we are, therefore, unaware of what the "natural" occurrence of secondary abortion would be in a population who did not use contraceptive devices. Our attention has been drawn to the occurrence of incompetence of the internal cervical os as a cause of re-occurring abortion (Lash and Lash, 1950) either as a congenital, physiological or traumatic phenomenon.

A small series of cases of secondary habitual abortion is presented here, to draw attention to the clinical phenomena, to examine the possible relation to primary habitual abortion and to discuss the causation with particular reference to Rh sensitization, cervical incompetency, and psychological factors.

MATERIAL

During the seven-year period from 1949 to 1957, the author has seen 22 cases of secondary habitual abortion (3 or more consecutive abortions after one or more normal pregnancies). These cases have come from a large area which is chiefly rural and sparsely populated. The environment, occupation (farming or distributive trades) and standard of living of all were very similar. The level of nutrition was high and there was free access to a high protein well-balanced diet. Contraceptive methods are not used but, compared with an industrial area, the marriage age is later. During the same period and from the same population, the author has treated only 13 cases of primary habitual abortion. On these figures, it would appear that, in a rural population with a relatively late marriage age who do not practise contraception, secondary habitual abortion is more frequent than the primary variety.

TABLE I

Cases of Primary Habitual Abortion

No. of Cases	No. Cured	Cause of Failures
13	5	5 cases of uterine malformation 3 cases—nothing abnormal detected

ANALYSIS

The second table demonstrates the age groups into which the patients and their husbands fall when the abortion sequences commenced.

TABLE II

Age	No. of Wife	No. of Husband	Age When Cured
20–24	3	–	–
25–29	2	2	–
30–34	4	2	2
35–39	8	7	5
40–44	3	6	4
45–49	2	5	1

Over half of them commenced in the decade 30–40, but considering the later marriage rate, and the fact that these patients had already had one or more normal pregnancies, the number at risk would be greatest in this decade. No definite conclusions can be arrived at as regards the influence of age. The impression gained is that a woman in her thirties is more liable to have one or two abortions from non-recurrent causes, and is thus more liable to become a habitual aborter if she has a susceptible psyche. The age of the husband runs closely parallel to that of the wife.

NUMBER OF NORMAL PREGNANCIES BEFORE SEQUENCE

Half of the patients had more than one normal pregnancy before the abortion sequence commenced and 3 women had abortions before the normal pregnancies. (Fig. 1.) This would

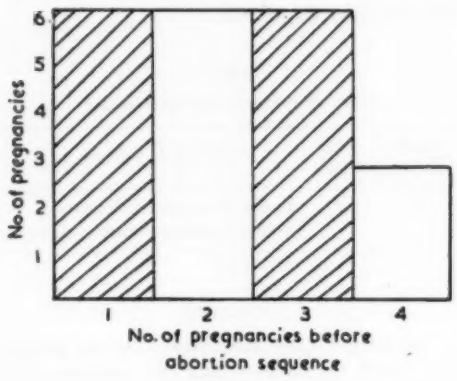

FIG. 1

appear to indicate that the cause of the habitual abortions arises after apparently normal childbirth. Apart from age, the conditions that immediately suggest themselves are Rh sensitization and cervical incompetency resulting from traumatic deliveries.

Rh Sensitization

The general consensus of opinion is that Rh sensitization does not occur more frequently among habitual abortions than among other

TABLE III

Rh Positive	Rh Negative	Antibodies	Not Tested
16	3	Weak (2)	3

cases, and the above table would tend to confirm this. There is, if anything, a less than normal incidence of rhesus negative mothers in this series. One rhesus negative and one rhesus positive mother had weak antibodies. Both of these subsequently gave birth to normal unaffected infants.

Cervical Incompetency

The possibility of cervical incompetence being a cause of repeated abortion must be considered. The idea of a pregnancy falling out of the uterus, or the membranes bulging through, and rupturing, from lack of support offers a very simple and mechanistic explanation of at least some of the previously baffling cases of repeated abortion. Within the past year at least two papers have appeared on this subject; one by McDonald (1957) describes 70 cases ascribed to cervical incompetence and treated by ligation of the cervix, with 33 successful pregnancies. Forty-three of these patients had had previous normal deliveries before the ligation was performed, and the author says that, of all the factors predisposing to cervical incompetence, previous childbirth would appear to be the most important. The other paper deals with a smaller series (Green-Armytage and Browne, 1957) and 9 cases were treated successfully. Some of these cases had the suture inserted before the successful pregnancy occurred. McDonald says that

there is little hope of success with the cervical suture unless the abortion occurs after the twentieth week. None of his cases treated before the twentieth week were successful, indicating that repeated abortions that occur before the twentieth week are not due to cervical incompetence.

In the present series, only a few of the patients had abortions after twenty weeks, and the history in these cases seemed to indicate that intra-uterine death had occurred sometime before the abortion. No patient gave the history of a sudden rupture of membranes which would indicate cervical incompetency. The experience gained in the observation and treatment of these cases agrees with McDonald that causes other than cervical incompetence operate in repeated abortions occurring before the twentieth week.

Histories of Treated Cases

When the earlier cases in this series were being treated, the author was very sceptical about the efficacy of progesterone, but nevertheless it was given. It was used in all forms in varying doses up to 120 mg. intra-muscularly daily. In several cases, implantation was unsuccessful.

If the patient had another abortion under the regime, all faith was lost in the use of progesterone. The author then adopted the subterfuge of giving an injection of micro-crystalline progesterone as a new substance which could not fail. This approach of absolute faith met with considerable success. The few patients in whom this approach failed were sufficiently sceptical to see through the scheme. Nevertheless, if some other agency intervened, before the onset of the menopause, which was of sufficient magnitude to overshadow the fear of another abortion, eventual success was assured. Like the primary habitual abortion, those in the secondary group are highly fertile, and have no difficulty in conceiving. A very brief résumé of each case history in the treated cases is appended to indicate the course of the obstetrical history and the factor that eventually led to normal delivery.

Case 1

Mrs. McD., 36 years, had one live birth, followed by at least 8 abortions (between 6 and 14 weeks). Three of these were so-called blighted ova. All the usual recommended types of treatment were given, including progesterone implants and prolonged bed rest without avail. The patient eventually was delivered of a second liveborn infant without any previous treatment. The patient became pregnant during a severe emotional family crisis which over-shadowed the desire to conceive; this lasted until after the patient felt movement which seems to be the final reassurance for this type of patient.

This patient's husband was an only child and seemed to have a pathological fear that history would repeat itself, and the wife was in a continual state of emotional agitation, as soon as she found that she was pregnant in case she would again fail her husband.

Case 2

Mrs. M., aged 44 years, was referred by her doctor with a history of having had 2 normal live births followed by 5 consecutive abortions between 10 and 12 weeks. She was examined and told that no abnormality could be found. She conceived 18 months later and was duly delivered of a normal healthy infant. She had no treatment apart from reassurance.

Case 3

Mrs. M., aged 34 years, had one normal delivery followed by 5 abortions (between 8 and 10 weeks). Progesterone orally was tried without success. In the 7th pregnancy 50 mg. of luteocyclin crystals were given intramuscularly on alternate weeks. The patient was told that the consultant had complete confidence in their efficacy. The patient carried to term and was delivered normally of a live infant.

Case 4

Mrs. N., aged 42 years, was referred for advice at her own request. She had had 4 normal deliveries followed by 3 abortions between 8 and 18 weeks. The patient was examined and reassured. She conceived 2 years later and was given 10 mg. ethisterone daily and 2 weekly injections of luteocyclin crystals 50 mg. until movement was felt. The patient had great confidence in the injections, travelling over 70 miles each time to get them. She had a normal full-term delivery.

Case 5

Mrs. G., aged 39 years, had had 3 normal deliveries. She then had 2 abortions and a stillbirth. She was found to be normal on examination and was reassured accordingly, and told to return for injections if she became pregnant. She conceived shortly afterwards and was given 2 weekly injections of anahaemin until the 20th week. She was eventually delivered normally at term.

Case 6

Mrs. G., aged 32 years, had 3 normal deliveries and one abortion when first seen. She was subsequently attended on 4 occasions to deal with early incomplete abortions. The patient was a nurse and had a great fear

of haemorrhage. Each time she became pregnant she anticipated an abortion with dread. Finally she was seen when threatening to abort. She was immediately put to bed and sedated heavily. She was kept under the influence of tranquillizers (25 mg. sparine intramuscularly twice daily) until movement was felt. The sedation was then gradually reduced and finally stopped. This patient had a normal delivery at term.

Case 7

Mrs. C., aged 32, had had 3 full-term deliveries and 3 consecutive abortions between 6 and 10 weeks when first seen; she was then 6-weeks pregnant. A mobile retroversion was corrected and the patient was given fortnightly injections of luteocyclin crystals in 50 mg. doses. She carried to term and was delivered of a healthy infant.

Case 8

Mrs. B., aged 36 years, attended when 6-weeks pregnant. She gave a history of having had one normal delivery followed by 3 ten-weeks abortions. She was treated as in Case 7 successfully.

Case 9

Mrs. G., was aged 36 years when first seen. She was pregnant for the eighth time. Her last period occurred 8 weeks before. She had had 2 normal deliveries, followed by 5 abortions (between 8 and 14 weeks). She was also treated as in Case 7 with a successful outcome.

Case 10

Mrs. H., aged 42 years, had 2 normal deliveries followed by a 10-weeks, and a 20-weeks abortion, and a premature stillbirth. The treatment was again as in Case 7. The outcome was again successful.

Case 11

Mrs. G., aged 35 years, gave a history of 2 normal deliveries followed by 5 early abortions. This patient was treated successfully in 2 subsequent pregnancies by reassurance and fortnightly injections of 1 ml. of anahaemin.

FAILED CASES

Case 12

Mrs. McC. had one normal delivery and 6 early abortions. The author attended the patient in all her pregnancies. All the usual varieties of treatment were tried including hormones, vitamins and antihistamines. The tranquillizing drugs were not tried. The foetal sac was recovered intact in 4 cases but it did not contain a foetus. The last pregnancy ended in abortion in 1957.

Case 13

Mrs. M. was aged 44 when the last abortion occurred. She had 2 normal deliveries followed by 3 abortions. She became menopausal after her last abortion. All the usual types of treatment failed in this case. It is significant that the author had been the medical attendant from the commencement of the abortion sequence in both these cases.

Reassurance was given in all cases. In addition luteocyclin was given intramuscularly in 6 cases successfully (it was unsuccessful in 3 cases). Anahaemin injections were successful in 2 cases. No drugs were used in 2 other cases. Finally heavy sedation was successful in 1 case.

CONCLUSIONS

Since the description of cervical incompetence and a rapidly accumulating literature on the efficacy of closure of the internal os by suture, interest in secondary habitual abortion has increased. In this report 13 cases of secondary habitual abortion were treated in women who had had between them 53 abortions. Only 2 cases failed eventually to deliver a normal full-term infant. In no case was there a suture used in the cervix.

The results with progesterone are interesting. In the first case treated (Mrs. McD.), progesterone was used unsuccessfully both by injection in very large amounts and by implantation, and when she finally achieved a successful pregnancy it was without progesterone. In the 2 cases that failed to respond, progesterone was also used. These 3 patients had always been under the care of the author and the early abortions were associated with him and the use of progesterone in the minds of the patients. In 6 of the other 9 cases, progesterone was used successfully and in 2 others liver injections.

The author feels that these patients, when they came to seek advice, had lost confidence in their ability to carry to term and were amenable to suggestion. The approach of absolute confidence and reassurance, especially when accompanied by an injection, was sufficient to effect a cure. If a woman is unfortunate enough to have one or two consecutive abortions for some reason that is not recurrent, her confidence is undermined, the next pregnancy is approached in an attitude of defeatism and the way is laid for a continuous abortion sequence. This can only be cured by a medical attendant in whom she has sufficient confidence (and he is unlikely to

be the one who attended her in earlier abortions) or until some circumstance arises which overshadows the importance of aborting.

Summary

A small series of secondary habitual abortion cases are described. Attention is drawn to the rarity of reported cases. The possible association of age, rhesus sensitization and cervical incompetence is examined. None of these factors is important except possibly cervical incompetence after the twentieth week.

The importance of the correct psychological approach is emphasized. The drugs used do not seem to matter.

Addendum

Since this paper was submitted for publication, one of the 2 cases which the author was counting as a failure has conceived and been delivered of a full-term normal infant after 5 consecutive abortions. Having lost faith in all medication she did not consult the author until she was 5-months pregnant. She then went to term uneventfully. This patient, who was extremely intelligent, attributed her success to a visit to a well-known shrine. Thus in all cases, with the exception of one woman who became menopausal, a successful outcome was achieved, by such varied therapy that success could only be attributed to psychological factors.

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EVALUATION OF LOW RUPTURE OF THE MEMBRANES AS A METHOD OF INDUCTION OF LABOUR WITH SPECIAL REFERENCE TO ITS ADVANTAGES OVER HIGH RUPTURE

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RUPTURE of the membranes as a method of inducing labour has been known for at least 200 years. It seems to have fallen into disuse until it was re-advocated by Fitzgibbon (1931). Since then it has become increasingly popular (Smythe, 1931; Statham, 1931; Little, 1934; Wilson, 1934; Higgins, 1935; Green, 1938; Dieckmann and McCready, 1947; Grier, 1947; Hosemann and von Massenbach, 1948; Gibson, 1948; Osborne, 1949; Husbands, 1950; Miles, 1951; Erving and Kenwick, 1952; Maher, 1952; Solomon and Starr, 1952; Tenney and Abrams, 1952; Daichman and Pomerance, 1953; Winn, Ware and Schelin, 1953; Bellingham, 1954; Keettel, 1954; MacKenzie, 1954; Pattison, 1955).

During the past few decades high rupture of the membranes has become a favourite method of induction in this country (Smythe, 1931). It had previously been used by Hamilton (1836) and, according to Kilian (1834), by Headley more than 120 years before.

The advantage ascribed to high rupture of the membranes over low rupture has been that the preservation of the forewaters is a barrier against intra-uterine infection (Smythe, 1931; Smythe and Thompson, 1937; Davis, 1948). Another idea is that the amount of liquor drained can be limited, avoiding perhaps an unnecessary degree of uterine retraction and, possibly, compression of the placenta or cord.

It would be desirable to know which method of surgical induction would be the best for routine use without disputing that there may be selected cases in which other methods are more suitable.

It is believed that rupturing the membranes in order to release the forewaters as gradually as possible is a method of inducing the onset of labour which brings about a physiological stimulation closely, though not entirely, resembling the natural course of events. This method will be assessed in a study of 500 booked cases.

THE METHOD

Every case was thoroughly scrutinized and the indications and contra-indications (e.g., an unfavourable cervix) were carefully considered. The forewaters were ruptured with long artery forceps, taking care not to cause any bleeding. The cervix was not traumatized by stretching, the membranes were not "swept" and a general anaesthetic was therefore not required. Vaginal antiseptics were not used.

RESULTS

Incidence

The 500 inductions (127 primigravidae and 373 multigravidae) represent an incidence of 7·4 per cent amongst 6,789 booked patients delivered between January, 1946 and June, 1952.

Indications

The indications are summarized in Table I.

TABLE I

Summary of Indications in the Bromley Series

Indication	Primigravidae	Multigravidae	Total	Per cent	Foetal Mortality Per cent
Toxaemia	102	112	214	42·8	10·0
Prevention of disproportion ..	—	119	119	23·8	1·7
Prolonged pregnancy	15	66	81	16·2	4·9
Unstable presentation	—	25	25	5·0	4·0
Previous rapid labour	—	23	23	4·6	0
Breech presentation	4	1	5	1·0	0
Miscellaneous	6	27	33	6·6	—
Total	127	373	500	100·0	7·8

Toxaemia

In 214 patients (102 primigravidae and 112 multigravidae) labour was induced for the treatment of toxaemia. The comparatively high proportion of multigravidae was due to the fact that in cases of toxaemia a spontaneous onset of labour occurred much more frequently in primigravidae than in multigravidae. Another reason was that multigravidae with a history of previous toxaemia of pregnancy were booked for hospital confinement.

Of the 214 patients 177 (82·7 per cent) were delivered within 2 days, and 194 (90·7 per cent) within 3 days.

There were 13 stillbirths and 8 neonatal deaths, a total mortality of 10 per cent. The perinatal mortality increased with the induction-delivery interval, but in many cases there were other hazards to the life of the foetus, such as prematurity and ante-partum haemorrhage.

However, the 21 deaths form 54·9 per cent of the total 39 deaths in this series of 500 inductions. This depressing result indicates that surgical induction, although perhaps the present-day treatment of "choice" in patients suffering from toxaemia, and probably often life-saving for mother and child, is far from satisfactory. Furthermore, of the 214 patients, one developed eclampsia after induction and another after delivery.

The worst results were obtained in 2 patients treated for many weeks previously for essential hypertension. One mother and child died whose deaths were attributed to anaesthetic mis-adventure; the other (one of the two cases of eclampsia) lost the baby, and incidentally, several months later committed suicide. It is not uncommon to find that attempts to obtain a living child in women suffering from essential hypertension, entailing severe restrictions and prolonged hospitalization, in the end result in disappointment.

Prevention of Disproportion

Artificial rupture of membranes was carried out in 119 multigravidae who gave a history of previous disproportion, long labour or stillbirth in any way attributable to mechanical difficulties owing to size or postmaturity. Patients were also included in this class whose previous babies, though born alive, weighed about 10 pounds, and where it was feared that the patient might have an even larger foetus, if she were allowed to go to term. The treatment was not used in primigravidae because in them labour which starts spontaneously can give definite evidence of normality or the reverse. This has firmly established trial labour as superior to surgical induction of labour in suspected cases of disproportion in first pregnancies.

One outsized infant (13½ pounds) was stillborn owing to delay with the shoulders. This death does not prove that induction was a bad method of treatment, but that it should have been carried out earlier. One other stillbirth was due to prolapse of the cord which was 48 inches

long. This death may be attributable to the method, although there was the predisposing factor of the abnormal length of the cord.

Prolonged Pregnancy

Eighty-one inductions were carried out in patients with prolonged pregnancies, an incidence of 1·2 per cent amongst the 6,789 patients. The foetal mortality was 4·9 per cent (4 cases). Except for a breech delivery of a twin, the other 3 fatalities occurred in cases where induction was carried out later than at 42 weeks (43, 44 and 45 weeks, respectively).

The problem which confronts the obstetrician is not really the prolonged pregnancy but the diagnosis of postmaturity, a condition of the child endangering its survival. All known diagnostic criteria may let the clinician down in a given case, irrespective of whether they are used for diagnosis or as a guide to treatment. This includes the condition of the cervix.

An unfavourable cervix will indicate that induction in these cases is likely to be followed by inertia. Cases are met from time to time in which the cervix is unfavourable, but from all other available data the pregnancy has undoubtedly reached 42 weeks or more. MacKenzie (1954) goes as far as to say that if the cervix is unfavourable the patient is not at term, regardless of her dates. Whereas this may provide a working rule as to which cases are likely to respond to induction and which are not, it does not by any means imply that the foetus is safe as long as the cervix is "unripe". We have at times withheld induction in such cases and have subsequently found that the stillborn foetus showed signs of postmaturity, although it may not have been of large size.

Unstable Presentation

In 25 multigravidae, the membranes were ruptured for the treatment of unstable presentation. There was one stillbirth due to a severe pulmonary embolism in the mother.

Breech Presentation

The prevention of breech labour has been one of the objects of antenatal care at Bromley Hospital. Labour was induced in only 5 patients with breech presentation. No child was lost.

Owing to the risk of cord prolapse in breech labour, high rupture of the membranes may be preferable to low rupture if surgical induction is to be performed. If the legs are extended the risk is perhaps not as great as it is with the flexed breech which may be high at the onset of labour. Daley and Michael (1953) reported that in a series of 498 breech deliveries there were 25 cases of cord prolapse (5 per cent), but in only one case were the legs extended. It is possible that the cord is held up by the extended legs.

Induction-Delivery Interval

Eighty-two per cent of primigravidae and multigravidae were delivered within 48 hours of induction; 90 per cent of the former and 91 per cent of the latter were delivered within 72 hours. Thus parity had no influence on the success rate.

The success rate is, however, influenced by the method of induction.

Table II suggests that rupture of the membranes is followed by a shorter induction-delivery interval than other methods of surgical induction.

Table II

"Success Rate" After Different Methods of Induction

Method	Delivered Within		
	24 Hours Per cent	48 Hours Per cent	72 Hours Per cent
Stomach tube / Animal bladder } Crowther-Smith and Gibberd (1934) ..	14 / 41	40 / 69	66 / 88
Rupture of the forewaters (Eton)	59	82	91

Low rupture of the membranes is followed by a shorter latent period than high rupture (Smythe and Thompson, 1937; Bellingham, 1954; Bushby, 1958). The fact has to be emphasized that the slow seeping away of liquor following low rupture of the membranes results in a more rapid delivery than the sudden withdrawal of a pint of liquor by cannula. The gradual and continuously increasing retraction provides a prolonged stimulus to initiate intermittent uterine contractions (Gunn, 1958).

In the Bromley series parity did not seem to influence the induction-delivery interval. By contrast, the patient's age was a definite factor: of 389 patients under 35 years, 59 (15·2 per cent) were undelivered within 48 hours, whereas of 111 patients aged 35 years and over, 32 (28·8 per cent) were undelivered.

The nearer term induction was carried out the higher was the "success rate".

Interference and Complications After Induction

Instrumental Delivery

Twenty-seven patients were delivered by forceps, an incidence of 5·4 per cent amongst the 500 inductions. The general forceps rate at the hospital during the same years was 4·6 per cent. It would thus seem from the figures of the Bromley series that induction of labour does not significantly increase the forceps rate, provided cases are considered on their individual merits according to the criteria previously described. Indeed, for the prevention of disproportion in multigravidae with a bad obstetric history, surgical induction at any time from the 37th week onwards, depending on the estimated size of the foetus, may be looked upon as a means of reducing the number of forceps deliveries.

Caesarean Section

This operation was carried out in 5 patients (1 per cent); in 4 for foetal distress and in 1 because of inertia after induction for toxaemia. One Caesarean section was performed for foetal distress after induction on account of previous dystocia. In the other 4 labour had been induced for the treatment of toxaemia. One of these patients and her child died as a result of anaesthetic misadventure. One other child was lost when Caesarean section was carried out for foetal distress.

The place of Caesarean section in the treatment of foetal distress is by no means easy to assess. The operation is more likely to save the child if it is carried out promptly following the diagnosis of the earliest signs of foetal distress.

After induction for toxaemia, Caesarean section is rarely required on account of inertia because toxaemic patients usually respond readily to induction. If it has to be done in cases of severe toxaemia, it usually means that induction should have been carried out earlier.

After induction for disproportion in multigravidae abdominal section should hardly ever be necessary unless inertia or foetal distress supervene, or disproportion has in fact not been prevented.

In cases of postmaturity, in view of the difficulties of diagnosis and of deciding whether, in the individual case, the foetus is at special risk, Caesarean section is rarely justified in the absence of other indications; there may be a place for it if, on artificial rupture of the forewaters, scanty greenish liquor is found; or if pelvic examination suggests that postmaturity is likely to be complicated by inertia.

If in such a case the hindwaters are ruptured, liquor may not flow through the cannula owing to its scantiness and viscosity. It has been observed that, in this type of case, the cannula was introduced in different directions in an attempt to draw liquor until, finally, a flow of blood indicated that the placenta had been separated. Blaikley (1956) reports one such case where the placenta was separated and severe bleeding occurred. Caesarean section was carried out and a dead baby was delivered. "The mother died from haemorrhage and shock."

Although such disastrous results from high rupture of the membranes are rare, one has only too often seen haemorrhage following introduction of the special cannula used for rupture of the hindwaters. Two cases leading to death of the child were reported by Russell, Smith and Yule (1956). This is but one of the reasons why

TABLE III

Rupture of the Forewaters: Incidence of Puerperal Pyrexia, Classified According to Induction-Delivery Interval

Length of Induction-Delivery Interval Hours	No. of Patients Delivered	Puerperal Pyrexia (All Causes)		Puerperal Pyrexia Due to Genital Infection	
		No. of Cases	Incidence Per cent	No. of Cases	Incidence Per cent
0–12	173	10	5·8	3	1·7
12–24	124	6	4·8	2	1·6
24–48	114	4	3·5	2	1·8
Over 48	89	2	2·3	1	1·1

TABLE IV

The Influence of Parity on the Incidence of Puerperal Pyrexia After Surgical Induction

Parity	No. of Patients	Puerperal Pyrexia All Causes		Puerperal Pyrexia Genital Infection	
		No.	Incidence Per cent	No.	Incidence Per cent
Primigravidae	127	7	5·5	3	2·4
Multigravidae	373	15	4·0	5	1·3

rupture of the forewaters is preferable, but emphasis must be placed on the importance of careful selection, examination and preparation of patients.

Maternal Morbidity

There were 22 cases of notifiable puerperal pyrexia, irrespective of cause, an incidence of 4·4 per cent. Eight cases (1·6 per cent) were due to genital infection. There was no rise in the incidence of genital or extra-genital infection with increasing induction-delivery interval. (Tables III and IV.)

Although the overall incidence of puerperal pyrexia is low, it is higher in primigravidae. This applied particularly to cases of genital infection.

The question arises whether the forceps rate can be regarded as indicative of operative interference predisposing to genital infection. Details of forceps cases are available for the first five years of the series. There were 370 surgical inductions. The forceps rate was 15·5 per cent amongst primigravidae and 1·1 per cent in multigravidae.

The genital infection rate was nil in either group of forceps cases. In one primigravida puerperal pyrexia followed forceps delivery, but was due to urinary infection. The gross morbidity (by the old standard of puerperal pyrexia) was 4·0 per cent (4 out of 99 cases) in primigravidae and 1·8 per cent (5 out of 271 cases) in multigravidae. As there was no case of genital infection amongst the forceps cases, we cannot attribute the higher morbidity rate amongst primigravidae to an increased forceps rate amongst these patients.

One of the reasons why high rupture of the membranes was advocated (Smythe, 1931; Smythe and Thompson, 1937; Davis, 1948) was that it preserved the integrity of the bag of forewaters as a barrier against infection. It is therefore of interest to compare the maternal morbidity in the Bromley series with that of Smythe's (1949) series of about the same period and with that observed in other series (see Table V).

It is difficult to understand why the maternal morbidity rates show such a wide range amongst

TABLE V

Complications After Induction by Different Authors

Author	No. of Cases	Method of Induction	Foetal Mortality Per cent	Maternal Morbidity Per cent	Maternal Mortality Per cent
Gibson (1952)	843	Various methods, mostly low rupture and pitocin	20·05	7·0	0·6
Evans (1954)	843	Various surgical methods	15·6	10·8	0·8
Knerr (1951)	68	Bougies, pitocin	14·7	—	—
Dodds (1931)	338	Ol. Ric., quinine, pituitrin	14·2	—	—
Spencer (1936)	111	Bougies	11·7	9	1
Rendle-Short (1940) ..	87	Cannula	9·4	2·3	1
Eton	500	Low rupture	7·6	4·4	0·2
Smythe (1949)	214	Cannula	6	0·9	0
Smythe and Thompson (1937) ..	200	Cannula 105 Low rupture 95	3·9 4·7	3·9 14·7	1·95 1·9
Cron, Randall and Kretzschmar (1939) ..	1,669	Medical, bag, bougie, low rupture, 43 per cent elective	4·7	—	—
Bellingham (1954) ..	321	Usually pitocin before and after cannula induction	4·4	—	0
Dieckmann and McCready (1947)	618	Low rupture, pitocin, bag	2·7	14·7	0·3
Erving and Kenwick (1952)	600	Low rupture and pitocin, elective	2·14	3·16	0
Hill (1954)	465	Low rupture, pitocin in 37 per cent of cases, 68 per cent elective	2·0	8·0	0
Osborne (1949)	162	Low rupture, pitocin, elective	1·9	6·0	—
Grier (1947)	129	Low rupture, 95·3 per cent elective	1·6	—	—
Hanley (1951)	653	Low rupture, pitocin, elective	1·2	—	0
Daichman and Pomerance (1953) ..	657	Low rupture, pitocin, elective	0·45	1·1	0
Winn, Ware and Schelin (1953) ..	278	Low rupture, pitocin, elective	0	0·7	0

different authors, unless standards of morbidity differ. It may be assumed that amongst British workers the standard is the same (in accordance with the regulation concerning notifiable puerperal pyrexia). Yet we observe amongst the British series a range from 0·9 per cent to 14·7 per cent. If British morbidity rates are compared, they would support the view that cannula inductions were followed by a very low incidence of maternal morbidity. However, the Bromley figure of 4·4 per cent includes all cases of notifiable pyrexia, whatever their cause (mastitis, respiratory infections, etc.). Smythe (1956) included only cases of genital infection in his series published in 1949. If the same criterion is used in the Bromley series during the first five years of the series (when the same standard of puerperal pyrexia was used as in Smythe's series) the maternal morbidity rate in the Bromley series was only 0·5 per cent. Thus, using identical criteria and standards we find no evidence that high rupture of the membranes is safer than low rupture from the point of view of prevention of genital infection.

Other workers, such as Arthure (1954), hold that the risk of uterine infection does not seem to be related so much to the level at which the membranes are ruptured as to the duration of the latent period. This view is also held by Evans (1954) in whose series the morbidity rose with the length of the induction-delivery interval. The results in the Bromley series lend no support to this view as it was found that the morbidity rate (notifiable pyrexia from all causes) did not increase with the duration of the induction-delivery interval.

Primiparity did, however, appear amongst the factors influencing the maternal morbidity rate, particularly regarding genital infection. This finding may be due to a higher incidence of vaginal examinations and manipulations in primigravidae. As there was no case of genital infection following forceps delivery, instrumental delivery did not by itself predispose to puerperal pyrexia.

It may be concluded that with the method of induction used in the Bromley series, the risks of genital infection following rupture of the membranes did not so much depend on the length of the induction-delivery interval, nor on the use of forceps as on the type of labour. There was no evidence that rupture of the forewaters entailed a higher risk of uterine infection than high rupture of the membranes.

The technique of surgical induction at Bromley was one of asepsis. The membranes were not "swept". Antiseptics were not allowed to impair the vaginal defence, and care was taken to avoid bleeding into the vagina.

Infant Mortality

The stillbirth rate is one of the points to be taken into consideration in evaluating the safety of low rupture of the membranes.

There were 29 stillbirths (5·8 per cent) and 10 neonatal deaths (2 per cent). The perinatal mortality attributable to induction was 0·4 per cent: one case of maternal hyperpyrexia due to urinary infection and one case of prolapse of the cord. The latter case may be considered to be directly attributable to the method of induction although the abnormal length of the cord (48 inches) was a strongly predisposing factor.

If Table V is examined from the point of view of foetal mortality in the various series and with different methods of induction, the lowest foetal mortality will be found in some series of low rupture of the membranes; but they cannot be compared with others because they were mostly elective inductions.

Gibson's (1952) series may not be comparable because he included 12 abortions. If these are subtracted, his foetal mortality becomes 18·6 per cent (157 children out of 843 inductions). His series includes 635 cases of toxaemia in which the foetus is at considerable risk whatever the mode of delivery.

It is of particular interest in this study to compare the results of Smythe's (1949) series with those of Bromley. Smythe's series gives a corrected mortality of 6 per cent, after excluding all non-viable, macerated and malformed foetuses. If these are included (as they are in the Bromley series), his figure becomes 11·5 per cent which is about twice that of the Bromley series (5·8 per cent).

The series thus provide evidence that, from the point of view of foetal survival, low rupture of the membranes as carried out in the Bromley series yielded better results.

Prolapse of the Cord

There was one case of cord prolapse amongst the 500 inductions and the child was stillborn (No. 365). Labour had been induced at 38 weeks for previous dystocia. The induction-delivery interval was 48 hours 50 minutes, the second stage 40 minutes. The prolapsed cord was 48 inches long. The abnormal length of the cord predisposed to prolapse (MacLennan, Wrigley and Percival, 1955). The incidence of this complication after induction was 0·2 per cent. During the period of the series there were 23 cases of cord prolapse in the non-induced 6,289 patients, an incidence of 0·37 per cent, which is nearly twice as high. The series thus provides little evidence that artificial rupture of the forewaters by the method described predisposes to prolapse of the cord.

Evans (1954), in a review of 843 cases, compared inductions by stomach tube, animal bladder, and high and low rupture of the membranes, and found "that the incidence of cord prolapse was approximately the same whatever the method of induction". He found altogether 27 cases of cord prolapse in his series, but in every case in which the stillbirth was attributed to the induction, the head was not engaged when induction was carried out.

For the purpose of avoiding cord prolapse it might be desirable not to carry out low rupture of the membranes if the head is not engaged. In these patients there may possibly be a case for high rupture of the membranes. Whichever

method is used, the precaution should be taken to examine the patient vaginally at suitable intervals until the head has descended into the pelvis because the success of emergency treatment depends on the speed of diagnosis of cord prolapse. If recurrent transverse lie is the indication for induction, rupture of the forewaters is more likely to fix the head after version, but every attempt should be made to bring the head down as low as possible by emptying bowel and bladder, by pushing the head down and applying pads and binder.

Summary and Conclusions

A continuous series of 500 inductions by low rupture of the membranes is reviewed. The method is briefly described.

In cases of toxaemia the shorter induction-delivery interval renders rupture of the forewaters preferable to high rupture. The foetal mortality increased with the induction-delivery interval, but in many cases there were other more definite hazards to the life of the child.

For the treatment of disproportion, induction seems to have a definite place in multigravidae.

In cases of prolonged pregnancy the diagnostic criteria of postmaturity may be controversial. Examination of the liquor amnii may indicate whether the foetus is in danger. In such patients no liquor may be obtained with the cannula method.

In patients with unstable presentation low rupture of the membranes is more likely to make the presenting part engage, but there may be a greater risk of cord prolapse than with high rupture of the membranes.

In cases of presentation of an extended breech low rupture of the membranes is satisfactory, but with a high flexed breech there may be a place for high rupture.

There is no maternal mortality directly attributable to the induction method of rupture of the forewaters. The same cannot be said in the case of high rupture of the membranes.

There was no evidence that rupture of the forewaters entails a higher risk of uterine infection or foetal mortality than rupture of the hindwaters.

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CAVERNOUS ANGIOMA OF THE CERVIX

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ANGIOMAS of the cervix uteri have only rarely been reported in the literature. Gerbie, Hirsch and Greene (1955) said there had only been 12 instances. These authors in a paper devoted to vascular tumours of the female genital tract quoted 5 cases of their own, one involving the cervix. Their patient had suffered from uterine fibromata and pelvic cellulitis and the discovery of a vascular patch on the cervix was incidental. The tumour was not thought to have given rise to symptoms. These authors state that angiomata have also been described in the ovary, round ligament, Fallopian tube, uterine wall and vagina. In all these situations the tumours are very rare. Ritchie and Giles (1955) reported 10 cases in which angiomatous tissue was observed in endometrial curettings and we have recently encountered the condition in a patient suffering from excessive loss.

Machado and Junqueira (1939) claimed to be describing angioma of the cervix for the first time. They saw 6 cases in whom there were wine-coloured, soft, spongy lesions and in each case the patient complained of vaginal bleeding especially from contact. The taking of biopsy specimens precipitated haemorrhage severe enough to require control by stitching. They found evidence of chronic cervicitis in each case. Weed (1948) saw a case in a woman requiring treatment for cystocele and multiple fibroids. She had had one pregnancy and throughout its full duration experienced periodic bleeding, probably from the angioma. This lesion was of mixed type, partly capillary and partly cavernous. Another case was seen by Brandfass and Scheffey (1955) in a woman of 54 who had had a partial hysterectomy some years previously. She experienced scanty haemorrhage for one day only and a cervical biopsy was carried out as part of the investigations to exclude malignancy. Histological section showed a cluster of dilated vascular spaces in the cervical stroma close to the canal. It is of importance that there was no sign of the tumour during vaginal inspection of the cervix.

Voigt (1955) describes a woman of 33 years who experienced backache and a bout of vaginal bleeding a fortnight after the end of a period. Vaginal examination showed a dark blue red tumour the size of a walnut attached to the cervix. Blood was dripping from the external os. No active treatment was employed until a month later when she had a haemorrhage severe enough to bring her into hospital. Curettage showed normal endometrium only. The haemorrhage could not be controlled and amputation of the anterior lip of the cervix was carried out. Histological section showed a gap in the mucosa lining the canal which was evidently the source of the haemorrhage. The connective tissue beneath it was of normal vascularity for a short distance only. Beyond this the tissue consisted of large vascular spaces filled with blood and lined thinly by endothelium.

Voigt questions the identity of these lesions as neoplasms and considers that some of them are granuloma angiomatosum or granulation tissue with abundant formation of blood vessels.

In Voigt's survey of the literature he found less than 30 cases affecting the uterus and Fallopian tubes. Only 2 of these, described by Spanish authors, affected the cervix.

Case History

A nulliparous woman, aged 47, was admitted to hospital with a history of excessive and irregular periods for two years. She stated that there had been excessive loss for the whole of her menstrual life. She had some frequency of micturition and a moderately raised blood pressure (180/110).

Examination

There was a hard fixed midline abdominal swelling reaching up to the umbilicus. Vaginal examination confirmed the presence of a large uterine tumour.

Operation

There were multiple uterine fibroids. Total hysterectomy was carried out and the tubes and ovaries left intact. Recovery was uneventful. No outward abnormality was noted in the cervix.

Pathology

The uterus was enlarged to about 1,250 g. weight by a series of fibroids, the largest of which was 10 cm. in diameter. One of the tumours, 5 cm. in diameter, bulged into and expanded the cavity of the uterus. The uterine cavity was clothed with a fully developed and apparently normal menstrual endometrium. The cervix was covered with normal squamous epithelium and the stroma, for the full thickness of the cervical wall, was packed with a series of wide vascular channels filled with blood and lined by a single layer of flattened endothelial cells (Fig. 1). There were no inflammatory changes at all, a feature at variance with the contention of Machado and Junqueira (1941) that the cause of growth is chronic cervicitis.

The fibroids were of whorled fibromuscular tissue without degenerative change.

Discussion

In our case there is no evidence that the angioma gave rise to any disturbance of health. The marked increase of loss in the two years before operation is readily attributable to the intra-uterine fibroid but one is left with the suspicion that the cervical lesion may have contributed to the excessive loss in previous menstrual years. Voigt remarks that in practically all the cases he found in the literature the angioma was accompanied by a uterine tumour but this may merely mean that gynaecological operations are necessary to bring the relatively innocuous angioma to light. It cannot be suggested seriously that the formation of uterine tumours will initiate the formation of an angioma.

Although so rare the tumour is one of whose existence the obstetrician and the gynaecologist should be aware. It may cause intermenstrual haemorrhage and could complicate tears of the cervix during parturition. Unaccountable loss at such times and an awareness of the condition might bring to light more cases. The fact that so few cases have been reported and that no less than six have been described by two observers writing in collaboration indicates that it is much less rare than would at first appear.

The photograph is by the photographic section of the Royal Society of Medicine.

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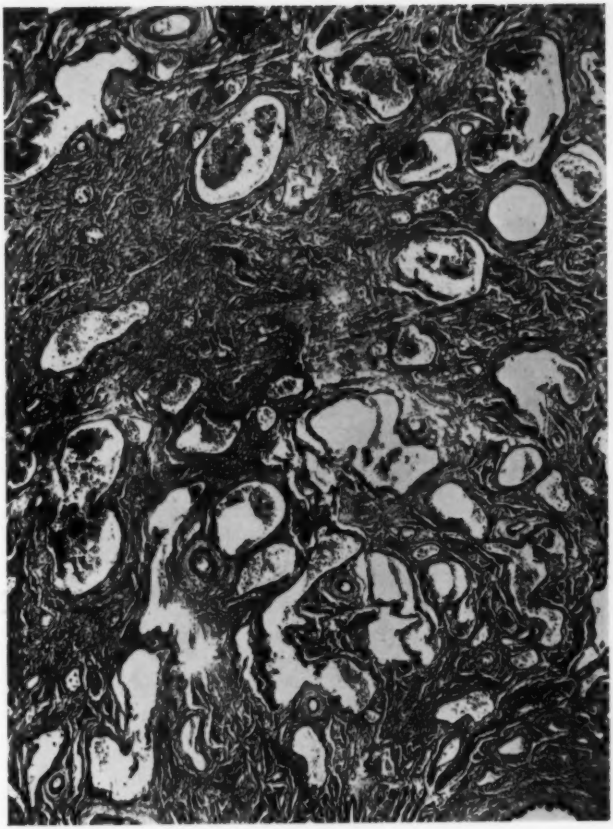

FIG. 1
Cavernous angioma of the cervix. ×25.

ACCIDENTAL HAEMORRHAGE FOLLOWING RUPTURE OF THE MEMBRANES IN CASES OF HYDRAMNIOS

BY

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EXAMINATION of eight well-known British Textbooks of Obstetrics reveals only two references (Baird, 1950; Donald, 1956) to separation of the placenta and consequent accidental ante-partum haemorrhage occurring after rupture of the membranes in cases of hydramnios. Nor, so far as is known, is there any reference to this complication in the recent literature on the subject of hydramnios. In particular, Macafee (1950) does not record a single instance amongst his 147 cases.

Three such cases have been encountered during the past twelve months in the Maternity Unit at the Freedom Fields Hospital, Plymouth, and it is felt that the association is deserving of attention. The hospital deals with approximately 1,000 deliveries each year, all patients being either emergency admissions, or booked for hospital confinement on the grounds of medical or obstetric abnormality. Examination of the hospital records for the 4 previous years has brought to light a further 4 cases, and a fifth case in a neighbouring maternity home which does not usually deal with such complications. Owing to regrettable deficiencies in the case notes and in the filing system, it is apparent that there were in fact other cases in addition, but the information regarding them is inadequate for inclusion in this publication.

CASE REPORTS

Case 1

A gravida-6 was booked for hospital confinement because of multiparity and hydramnios. Her dates were uncertain, but she was admitted when thought to be about 37 weeks pregnant with mild toxaemia. Labour began spontaneously 10 days later, by which time the blood pressure had settled to within normal limits. Soon after the onset of labour the membranes ruptured and about 8 pints (4,320 ml.) of liquor escaped: this was immediately followed by 1 pint (540 ml.) of fresh blood. The foetal heart, which had previously been normal in rate and rhythm, was not heard subsequently.

Eleven hours later a difficult Kielland's forceps rotation and extraction of a stillborn female child weighing 13 pounds (5,909 g.) was performed. About two-thirds of the maternal surface of the placenta was covered by blood clot.

The patient was transfused with 1 pint (540 ml.) of blood, and made an uneventful recovery.

Case 2

This patient, a primigravida, was admitted when 4 days overdue on account of toxaemia and hydramnios. Two days later medical induction of labour was attempted with intramuscular injections of 2 units of Pitocin every half-hour. Shortly after the third of these injections the membranes ruptured, and the patient lost several pints of liquor. A severe haemorrhage followed immediately, and this was accompanied by signs of foetal distress. After rapid resuscitation of the patient a lower segment Caesarean section was performed. A live female child weighing 4 pounds 15 ounces (2,242 g.) was delivered, but was shocked at birth and died 24 hours later. At post-mortem examination bilateral suprarenal haemorrhages were found.

There was some retroplacental clot, and also a quantity of blood lying inside the amniotic sac. The patient was transfused with 3 pints (1,620 ml.) of blood and 3 pints (1,620 ml.) of plasma, and made an uneventful recovery.

Case 3

A gravida-3 was found to have a twin pregnancy and hydramnios, and was admitted at the 38th week of pregnancy with toxaemia. Labour was induced by artificial rupture of the membranes, and it was reported that there was "liquor +++". This was followed at once by a massive haemorrhage, and the patient was transfused during the next few hours with 6 pints (3,240 ml.) of blood and 1 pint (540 ml.) of plasma. Four hours after the rupture of the membranes the first twin (a live

female) was delivered by the breech. Uterine inertia then became apparent, and the second twin was extracted with forceps: it was stillborn.

The puerperium was complicated by a deep femoral thrombosis.

Case 4

A gravida-4 was referred to the antenatal clinic with hydramnios when 32-weeks pregnant; radiography revealed an anencephalic foetus. Two days later artificial rupture of the membranes was carried out, and 5 pints (2,700 ml.) of liquor were withdrawn. Two haemorrhages occurred, 2 and 24 hours after this: each amounting to about ½ pint (270 ml.). A steady trickle of blood followed the second haemorrhage, and continued until a stillborn female anencephalic child was born after a further 6 hours of labour.

A blood transfusion was given, but the amount of this is not stated.

Case 5

This patient, a gravida-8, was admitted as an emergency at the 32nd week of pregnancy with a history of sudden rupture of the membranes and losing a large amount of liquor. On admission she passed 9 ounces (243 ml.) of blood into a bedpan, and the foetal heart was not audible. The next morning she delivered a stillborn male anencephalic child.

(Hydramnios is not specifically mentioned in the notes of this patient, but the case is filed under the heading of hydramnios in the monthly report book, and in view of the suggestive history, it is considered reasonable to include it in this series.)

Case 6

A gravida-4 was referred to the antenatal clinic at the 35th week of pregnancy with hydramnios, and an anencephalic foetus was demonstrated radiologically. Two weeks later artificial rupture of the membranes was performed, and this was followed after a few hours by bleeding. Labour did not ensue, and 2 further haemorrhages occurred. Two pints (1,080 ml.) of blood and 1 pint (540 ml.) of plasma were transfused, and 3 days later the patient was delivered of a stillborn female anencephalic child.

Case 7

A gravida-3 was admitted at the 32nd week of pregnancy with hydramnios, and radiography revealed an anencephalic foetus. The membranes were artificially ruptured, releasing 6½ pints (3,510 ml.) of liquor. Three hours later the patient passed 10 ounces (270 ml.) of partly clotted blood. There was no further bleeding, and 2 days later she was delivered of a stillborn female foetus which showed anencephaly and spina bifida.

Case 8

A gravida-2 was admitted at the 27th week of pregnancy with hydramnios and an anencephalic foetus; the foetal heart was not heard. The hindwaters were tapped with a Drew-Smythe catheter, and 5 pints (2,700 ml.) of liquor were allowed to drain away. Four hours later the patient was noticed to be bleeding and suffering from shock. Haemorrhage continued, and during the next 12 hours she was transfused with 2 pints (1,080 ml.) of plasma and at least 4 pints (2,160 ml.) of blood. (The case notes are incomplete.) At the end of this time breech extraction of a stillborn anencephalic child was performed.

The patient was so anaemic that she required further transfusion of 1 pint (540 ml.) of packed cells during the puerperium.

In each case it will be noted that the vaginal bleeding occurred very soon after rupture of the membranes, whether this was spontaneous or surgical.

Intra-uterine death occurred in 7 of the 9 foetuses at risk, though in one case the foetal heart was not heard even before the haemorrhage, which can consequently not be claimed to have caused the death of this foetus. In one of the two foetuses who survived the immediate crisis, foetal distress was so marked that Caesarean section was indicated, and even then the infant died shortly after birth.

The amount of blood lost was not accurately recorded in those cases in which it was massive, but the total loss appears to have varied between 9 ounces (243 ml.) and about 6 pints (3,240 ml.). Transfusion of blood and plasma was considered necessary to treat shock and blood loss in 6 out of the 8 cases, the amount transfused ranging between 1 pint and 7 pints (540 ml. and 3,780 ml.).

Causation of the Bleeding

The following mathematical calculations are not intended to be exact, since assumptions are made which are not strictly true. For instance, it is assumed that the uterine cavity is spherical and that the foetus and placenta have a density equal to 1. However, the figures do serve to indicate why separation of the placenta might be expected to occur more frequently when a relatively large amount of liquor is released.

Example I: Normal Pregnancy

Suppose the uterus contains a foetus weighing 7½ pounds (3,409 g.), with a placenta weighing 1¼ pounds (568 g.), and 1,000 ml. of liquor,

the volume of the foetus and placenta will be approximately 4,000 ml., and the total volume of the uterine contents will be 5,000 ml.

Since the volume of a sphere of radius r is $4/3\ \pi\ r^3$ and the surface area of such a sphere is $4\ \pi\ r^2$, it can be shown that the internal surface area of a (spherical) uterus whose contents have a volume of 5,000 ml. is 1,414 sq. cm.

Now, when the membranes rupture, and supposing that all except 200 ml. of the liquor escape, the volume of the uterine contents will diminish to 4,200 ml. Applying the same formulae, the surface area will be found to have decreased from 1,414 sq. cm. to 1,259 sq. cm., that is by about 10 per cent.

Example II: Hydramnios, with Normal Foetus and Placenta

Suppose the uterus contains the same volume (4,000 ml.), of foetus and placenta, but that there are 6 pints (3,240 ml.) of liquor. The total volume of the uterine contents will then be 7,240 ml., and the internal surface area of the uterus will be 1,810 sq. cm.

After rupture of the membranes, and again assuming that all except 200 ml. of liquor escape, the volume will be reduced to the same figure as in example I, viz., 4,200 ml., and the surface area to 1,259 sq. cm. This figure, however, represents a reduction of about 30 per cent from the original surface area.

Example III: Hydramnios with a Small Foetus, Due to Such Causes as Prematurity or Anencephaly

Suppose that the foetus and placenta together weigh 5½ pounds (2,500 g.), when their combined volume will be 2,500 ml., and that there are 6 pints (3,240 ml.) of liquor. The total volume of the uterine contents before rupture of the membranes will be 5,740 ml., and after rupture of the membranes 2,700 ml. (200 ml. of liquor being retained). The surface area in such a case would be reduced from 1,550 sq. cm. to 938 sq. cm., that is by about 40 per cent of its original value.

Now, the placenta is a relatively inelastic organ, and it is not difficult to appreciate that if the area of uterine wall to which it is attached suddenly shrinks by some 30 or 40 per cent, separation is much more likely to occur than if the reduction is only by 10 per cent. The fact that the placenta in cases of hydramnios tends to be larger than in normal pregnancies (Taussig, 1927) does not affect this conclusion. The greater the volume of amniotic fluid, and the smaller the foetus, the greater is the likelihood of placental separation.

Discussion

The problems which arise from this are twofold:

(*i*) The management of surgical induction of labour in cases of hydramnios, and

(*ii*) The management of labour in those cases of hydramnios where labour ensues naturally, or is induced by medical means.

Where surgical induction of labour is indicated, such as a case of hydramnios associated with an abnormal foetus, forewater rupture is dangerous since the escape of liquor is uncontrolled. The presenting part is usually high and often small (for example, a premature or anencephalic foetus) and will not exercise the usual "ball-valve" effect of a normal sized engaged vertex. Consequently nearly all the liquor escapes, and it escapes very rapidly.

If the hindwaters are ruptured with a Drew-Smythe catheter, it is often possible to check the flow of liquor after 1 or 2 pints (540 or 1,080 ml.), have been allowed to drain away, simply by withdrawing the catheter. Unfortunately this is not always so, since in hydramnios there is no clear distinction between forewaters and hindwaters, but at least the rate of flow is diminished.

A third method of surgical induction of labour is by abdominal paracentesis: here the volume of liquor to be withdrawn can be determined and limited at will. The disadvantages of this method are the technical difficulties and its uncertainty; indeed, abdominal paracentesis has been recommended as a method of relieving the symptoms of hydramnios *without* causing the patient to go into labour (Rivett, 1933, 1946; Erskine, 1944; O'Driscoll, 1945). Should labour fail to follow paracentesis, the operation can be repeated.

When labour has started spontaneously, or in response to medical induction, it is suggested

that a hindwater rupture should be carried out in order to control the release of the liquor, and forestall the sudden escape of a large volume of fluid which may occur when the membranes rupture naturally at the height of a uterine contraction.

Summary and Conclusions

(1) In cases of hydramnios there is a risk of accidental haemorrhage occurring shortly after the membranes rupture.

(2) Brief histories are given of 8 such cases.

(3) An attempt is made to explain the increased incidence of placental separation when an excessive amount of liquor is released.

(4) Where surgical induction of labour is indicated, abdominal paracentesis or hindwater rupture is preferable to forewater rupture.

(5) In labour, where this has not been surgically induced, a similar procedure should be carried out to limit the amount of liquor which escapes and to control its rate of escape.

Acknowledgments

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ANTERIOR SACRAL MENINGOCELE

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ANTERIOR sacral meningocele is a meningeal cyst which presents anteriorly through a unilateral congenital defect in the sacrum, due to agenesis of part of the anterior portion of the sacrum. It is a rare condition with unhappy complications resulting from incorrect diagnosis and treatment.

CASE REPORT

A married female, age 34 years, was first seen on 28th October, 1954. She was complaining of urinary frequency day and night for one month, which was not associated with pain, stress incontinence or constipation. Her menstrual history was normal, and her last menstrual period was on the 23rd October, 1954. She had dysmenorrhoea. She had one child, delivered at full term with normal delivery 13 years previously.

On bimanual examination, a large, round, firm abdomino-pelvic tumour, was palpable. It appeared to be impacted in the pelvis. The cervix was situated anteriorly, behind the symphysis pubis. A tentative diagnosis was made of a cervical fibroid. The patient was admitted to the ward three days later.

General physical examination revealed no abnormality, apart from the tumour.

The results of investigations were as follows: *Intravenous pyelography:* the pyelograms were normal. The congenital deformity of the sacrum as shown in Figure 1 was revealed. *Blood:* haemoglobin 86 per cent; group O; rhesus factor positive. *Urine:* no abnormality.

As her symptoms were severe, a laparotomy was carried out on the 2nd November, 1954. The findings were as follows. A large, tense, retro-peritoneal cyst was found filling the pelvis, and rising up into the abdomen. The uterus and adnexa were normal. The diagnosis of anterior sacral meningocele was considered, in view of the X-ray findings and the position of the cyst. The rectum was narrowed and compressed by the cystic mass. The peritoneum over the cyst was divided and separated easily from it. Owing to its bulk, the cyst was partly aspirated and found to contain clear, colourless fluid. The cyst was mobilized and a narrow pedicle was found attaching it to the upper part of the sacral deformity. The pedicle was ligated and the cyst removed. The posterior parietal peritoneum was closed and the abdomen closed without drainage. The condition on return to the ward was good, and post-operatively her general condition was satisfactory the next day.

Some 24 hours later, she developed a temperature of 101·4 degrees and a blood-stained discharge from the rectum. The pyrexia persisted in spite of antibiotic therapy and she complained of difficulty in micturition, but there was no sign of neurological significance until the 10th November, 1954, when she developed neck rigidity. A lumbar puncture was performed and *Escherichia coli* was found in the fluid. Cisternal puncture was performed and 100 mg. Streptomycin was injected intrathecally.

On the 13th November, 1954, she was profoundly collapsed and shocked with a temperature of 105 degrees. Cisternal puncture revealed a clear cerebrospinal fluid and a further 100 mg. of Streptomycin was injected. A few hours later she lapsed into coma and died.

PATHOLOGICAL REPORT

(1) The fluid in the cyst was found to be cerebrospinal fluid.

(2) Histology of the cyst showed a fibromuscular wall without definite inner lining; in the wall, there were small mucus-containing cysts lined, partially, by a single layer of columnar mucus-secreting and, partially, by pseudostratified epithelium. No nervous tissue elements were present.

(3) At the post-mortem the rectum was collapsed and its posterior wall was involved in the wall of a chronic abscess cavity on the

anterior aspect of the sacrum. The right half of the sacrum showed a circular defect involving the lower half of the bone. Above the defect there was an opening through which pus oozed from the sub-arachnoid space of the spinal cord. The membranes of the brain were congested and the lower part of the cord was encased in pus in the sub-arachnoid space.

Discussion

Three groups of symptoms are described by Brown and Powell (1945):

(1) Local symptoms due to pressure of the cyst on the pelvic viscera, e.g., constipation, menstrual disturbances—dysmenorrhoea, urinary symptoms—attacks of infection, incontinence and dysuria, and pain distributed along the sciatic nerve.

(2) Symptoms due to the neurological defect in the sacral segments, e.g., sphincteric disturbances and sacral anaesthesia.

(3) Intermittent increase in intra-cranial pressure by direct pressure, as in sitting, giving rise to headache, nausea and malaise. This varies with the width of the pedicle.

The condition usually shows in the first three decades of life. Coller and Jackson (1943), in a review of 23 cases, record the proportion of female to male as 20:3. The defect in the sacrum was commoner on the right side than on the left side. Eighteen cases were treated surgically with a mortality rate of 44 per cent. The diagnosis is made on clinical symptoms, the presence of a fluctuant cystic mass in the pelvis and the X-ray appearance, which reveals a smooth, oval defect on the one side of the distal third with deviation of the sacrum itself to the opposite side. The lower margin is the tip of the sacrum and the coccyx hooks under it (scimitar sacrum) as in Figure 1. Other possible tumours in the hollow of the sacrum are lipoma, hygromas, chondromas, gliomas, teratomas, chordomas, plasmocytomas and pre-sacral dermoid cysts.

In 1837, an unnamed "Distinguished surgeon" reported a case to the Medical Society of London, of anterior meningocele which was discovered at autopsy, when a large cyst was found filling the pelvis. The patient had died 4 days following delivery.

Pupovac (1903) first reported treatment through a dorsal incision. He resected part of the meningocele and closed the remainder by suturing it together, with resultant cure. Robinson (1903) operated on an infant aged 11 months. He ligated the pedicle with silk. At post-mortem an associated anterior meningocele was found extending from level D.12 to the sacrum.

Further reports of cases were recorded by Coqui (1916), Roux (1918), Weber (1921), Kennedy (1926), Luth (1937), and Santy (1938). Pick (1929) recorded a case of a soldier with lifelong constipation and a palpable retro-rectal tumour. This was aspirated through the rectum resulting in meningitis and death. Eder (1949) reviewed the world literature and found 45 cases. Sherman, Caylor and Long (1950) recorded 3 cases and reviewed 34 cases. Of these, 26 cases had been subjected to diagnostic or therapeutic surgical procedures, 15 cases developed meningitis and 11 were fatal. Of 9 cases, which were treated by aspiration or excision through the rectum or vagina, only 2 cases survived. Caliham (1952) mentions at least 52 cases recorded in the literature. Laird (1954) recorded 7 pre-sacral dermoid cysts with communication to the anal canal. Rowlands (1955) recorded 2 further cases, one treated surgically and the other conservatively, with survival of both cases.

Treatment

In spite of antibiotic therapy, the danger of ascending meningitis is still very high, as illustrated in the case recorded. Unless the symptoms are severe, conservative treatment is advisable. If the condition is discovered during pregnancy Caesarean section may be considered, though several of the cases recorded had normal pregnancies, including our own case.

If operative interference is indicated, a posterior midline approach from the 5th lumbar vertebra to the coccyx is recommended by Brown and Powell (1945). The sacro-spinalis and the gluteus maximus are incised and retracted. The cyst is exposed, mobilized, and then opened, with the patient in Trendelenburg's position, to see if any nerve tissue is present in it.

FIG. 1
X-ray showing oval defect in distal third of the sacrum—Scimitar sacrum.

The cyst is excised and closure with a double row of interrupted silk sutures is done. The wound is closed without drainage and elastic external pressure applied. The exposure of the pedicle from the abdominal approach is very difficult as our case illustrates.

Summary

A case of anterior sacral meningocele is recorded. The danger of ascending infection with meningitis is illustrated in this case, which proved fatal. The symptoms are described as being due to local pressure, nerve involvement, and alteration in the cerebrospinal fluid pressure. The diagnosis is made by the discovery of a retro-rectal cystic tumour and the typical X-ray appearance. A review of the literature is recorded and a description of the operative treatment recommended is mentioned.

We are indebted to Mr. Vyvyan J. Davies for his permission to record this case and for his helpful criticism and advice, and also to Dr. O. G. Williams for his report on the section and the post-mortem findings.

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A CASE OF HYDROPS FOETALIS AND SEVERE TOXAEMIA AFTER 23 WEEKS GESTATION

BY

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MRS. D.C., aged 30 years, attended the London Hospital on 16th October, 1957, to book for her third confinement. At this time she was 16-weeks pregnant.

PAST OBSTETRICAL HISTORY

In 1954 the patient had a normal pregnancy, there being no signs of pre-eclampsia, and she was delivered at term of a healthy infant weighing 7 pounds 5 ounces. During this pregnancy she was found to be Rhesus negative, but no antibodies were detected.

In 1956, after 32 weeks of amenorrhoea, she was diagnosed as having a twin pregnancy, and at this time a Rhesus antibody titre of 1:64 (albumin) was reported. Two weeks later she commenced spontaneous labour and was delivered of uniovular twin macerated foetuses weighing 4 pounds 2 ounces and 4 pounds 4 ounces. Throughout this pregnancy the patient was quite well, there again being no signs of pre-eclampsia.

THIS PREGNANCY

The patient's Rhesus antibody titre was 1:128 (albumin) after 16 weeks of amenorrhoea and her husband was found to be Rhesus positive, probable genotype CDecDE, which is homozygous for the D factor.

Apart from hyperemesis gravidarum in the first trimester she remained well until she was admitted to hospital on 25th November, 1957, two days before the 23rd week of pregnancy.

She was admitted because of headache, generalized oedema, a blood pressure of 210/140 and urine containing a half volume of albumin. The fundus uteri was the height expected of a 34 to 36 weeks pregnancy, the abdominal girth measuring 40 inches. As the foetus was difficult to palpate the large uterus was attributed to hydramnios, and this was confirmed radiologically showing a foetus of 20–22 weeks maturity and the uterine outline of about 34 weeks.

Twenty-four hours after entering hospital the severe pre-eclampsia had not improved in spite of heavy sedation.

A surgical induction was performed and 26 ounces of clear yellow fluid were removed. Almost 36 hours later the patient aborted a pale and grossly oedematous foetus which weighed 1 pound 14 ounces. The placenta, which was manually removed because of a 70 ounce post-abortal haemorrhage, was large, friable and pale; about one-tenth of its substance was involved in a red infarct. It weighed 1 pound 15 ounces and its histological features were reported as consistent with erythroblastosis foetalis. There was no evidence of hydatidiform changes.

In the puerperium the patient developed a severe oliguria, the cause of which was probably related to both the severe pre-eclampsia and the sudden severe 70-ounce post-abortal haemorrhage. Her condition deteriorated during the first 6 days when her blood urea rose to 400 mg./100 ml. With restricted fluids and a balanced

electrolyte intake she gradually recovered. Three months later she was re-admitted to hospital for ligation of her Fallopian tubes, and at that time her blood pressure was 110/70 and her blood urea was 30 mg./100 ml.

Discussion

Pre-eclampsia is often seen in association with hydrops foetalis and the presented case demonstrates this unusually early in pregnancy. As the first two pregnancies had not been complicated by pre-eclampsia it would seem that the hydropic gestation of the third pregnancy might have contributed to its cause. During the 5 years 1952 to 1956 inclusive, there were 85 babies affected with erythroblastosis foetalis delivered at the London Hospital. Ten of these were hydrops foetalis and in 3 cases the mothers had pre-eclampsia, one severely. Each of these mothers was a multigravida and yet not one had ever had pre-eclampsia before. During these 5 years the incidence of pre-eclampsia among all multigravidae was 6·6 per cent, multigravidae who had not had pre-eclampsia previously 3 per cent (approximately); the mothers of 85 Rhesus affected babies 6 per cent; and the mothers of the hydropic stillbirths 27 per cent. Walker (1958) found pre-eclampsia in 20 per cent of mothers delivered of hydrops foetalis, and Javert (1942) reported it as being as common as 30 per cent. It seems that if Rhesus incompatibility is to cause or aggravate pre-eclampsia it will only do so when the placenta and foetus have undergone hydropic degeneration and where possibly there is also an excessive amount of liquor amnii. There is no relationship between pre-eclampsia and stillbirths which, although they are caused by Rhesus incompatibility, are not hydropic.

Acknowledgment

I wish to thank Mr. Alan Brews for permission to publish.

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COMMON FACTORS IN TRICHOMONAS VAGINITIS

BY

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TRICHOMONAS vaginitis continues to challenge the gynaecologist as it has done for many years. High in incidence, variable in cure, and frequent in recurrence, our reaction to its problems is often one of frustration and annoyance. Frustration that the latest "curative drug" is no more efficient than the last, annoyance that a disease so well defined, described, and investigated, continues to humiliate the most skilled consultant, for his success in treatment is frequently no greater, and sometimes less, than the family physician.

The challenge of trichomonas vaginitis to our speciality is at least threefold. First, the world is filled with women who are miserable because of trichomonas. Second, gynaecologists have been ignoring its problems while refusing to accept such imperfect results in other commonly seen diseases. Third, the economic wastage of trichomonas is appalling. The drug market today is glutted with a variety of local and oral preparations, many efficient and safe trichomonacidal agents, yet each of us is aware that cures are inconsistent and often fleeting, and in the profession there remains confusion, for the specific preparation is not on our pharmacist's shelf. As medical practitioners we have compounded this confusion, adding a curious assortment of vaginal douches, some acid to acidify, some sweet smelling to purify, and some explosive, possibly to pacify. More recently, husbands have been incriminated. The contraceptive makers, quick to spot a good thing, have filled our medical journals with advertisements, designed to convince the doctor who does not prescribe such products, that he is contributing to failure of cure, and certainly to recurrence. The result of all this has been scepticism amongst the medical profession, and a realization that somewhere the jigsaw puzzle is still incomplete. Quoting the latest volume of *British Obstetrical and Gynaecological Practice*, Bourne (1955) states that "though it is possible to eradicate the organism and abolish the discharge and all the local discomfort within a day or two by treatment with almost any suitable antiseptic, recurrence after a week or months is only too liable".

One of the most significant papers on trichomonas vaginitis was written by Moore and Simpson in 1954 on "The Emotional Components in Trichomonas Vaginitis". They regard "trichomonas vaginitis as a psychosomatic symptom which occurs as a result of changes in vaginal physiology which are produced by emotional stress". They "accept the trichomonad as a specific infecting agent, but hold that the organism is incapable of producing symptoms, except when the vagina is conditioned by the effects of disturbed emotions".

Elsewhere in the literature, reference to the highly-strung nervous woman was made by Greenhill as long ago as 1931, but the paper by Moore and Simpson (1954) was the first to state categorically an aspect of this disease which is true in a high proportion of cases.

Certain basic concepts of normal vaginal physiology and trichomonas vaginitis in general have been accepted in this discussion. Trichomonas is often a normal inhabitant in the vagina, just as it is of the rectum and mouth. Clinical infestation occurs when the Döderlein bacillus-glycogen-lactic acid relationship is upset with elevation of vaginal pH, frequently occurring or recurring with menses or soon after. It has been well established that trichomonas vaginalis is a specific aetiological cause, and it is not similar to its flagellate relatives, particularly the

"Hominis" or intestinal strain. It has also been shown that the male can carry trichomonas vaginalis, but it is my own feeling that this aspect of both primary disease and recurrence is overemphasized, and in my own practice condoms are not advised as part of the overall method of treatment or prophylaxis.

Long ago it was shown that the organism does not invade the endocervical canal. Trichomonas vaginitis is therefore a specific localized infection, the result of overwhelming multiplication of a flagellate that is a normal contaminant of many women's vulva and vagina. We will attempt to show that a common factor, particularly in those cases that recur, is often present. This common factor is emotional tension, and in this series of 92 cases, was a prominent aspect of the problem in 70. Pregnancy, associated with trichomonas vaginitis, has been deliberately excluded from this discussion because of the special problems arising and associated with adequate treatment at this time. Control of symptoms is usually possible in pregnancy, but cure is seldom obtained until after the pregnancy has terminated.

In 92 cases, seen during the past four years, the cardinal symptom was leucorrhoea or irritation, associated with the presence of trichomonas. Table I shows the associated morbid conditions that were apparent in these

TABLE I
Trichomonas Vaginitis
(92 Cases)

Physiological	6
Significant cervicitis	17
Genital prolapse	7
Obesity	12
Emotional disturbance	70

patients. It will be noted that 6 of 92 patients were considered otherwise normal, without evidence of organic or emotional disturbances. These patients were invariably acute, easy to cure, and free of remissions.

Chronic cervicitis with erosion was found in 17 patients and was treated concomitantly with diathermy or coagulation. Treatment is usually indicated for these lesions because cervicitis contributes to disturbed vaginal physiology.

Associated genital prolapse in 7 patients was felt to contribute both to difficulties in eradication and proneness to re-infestation. Prolapse was usually of the traction type with large areas of redundant skin, ideal for loculation of pools of trichomonads. Effective cure in these cases often requires plastic vaginal surgery.

Obesity was significantly common, suggesting the emotional component as well as the excessive excoriation and perineal distress that forces these unhappy patients to seek medical care.

The *emotional disturbances* associated with trichomonas vaginitis, apparent in 80 per cent of patients seen, are so characteristic of all phases of the disease, so consistent in episodes of relapse, that failure to assess or treat the psychological background of the patient has been largely responsible for the disappointing cure rate so characteristic of this affliction. Too often the obvious concern of these patients has been the fear of venereal disease or malignancy.

TABLE II
Emotional Disturbances: Trichomonas Vaginitis
(70 Cases)

Emotional instability		18
Sexual disturbance:		28
Unmarried mothers	7	
Moral laxity	10	
Frigidity, dyspareunia	8	
Divorce, separation	3	
Domestic tension		9
Social maladjustment		3
Post-partum syndrome		4
Religious pre-occupation		1
Reactive anxiety "medical"		7

Seventy patients, as shown in Table II, were acutely or chronically disturbed. An attempt to classify the clinical types has been made, admittedly not in any scientific sense, as would be expected of our psychiatric colleagues, but more in a practical way, as seen by a gynaecologist doing day-to-day office practice.

(a) *Emotional instability*. This is the most common group. Fearful, tearful, resentful, insecure women, some were chronic nailbiters, many had been unable to solve their problems since childhood. These patients, given a lead, will say "I just can't relax". "Everything bothers me." With medical advice which does

not recognize their basic trouble, they develop a fetish with regard to vulvar and vaginal irritation. The least moisture drives them to carry out some form of perineal hygiene, and some will state that they bathe and douche many times a day. One patient said she douched every hour on the day prior to her initial visit. Obviously, these patients need a great deal of understanding and reassurance. Some need psychiatric help but most can be assisted by simple reassurance.

Seven were reactive anxieties in delivered, unmarried mothers, 6 of whom had given up their babies, one had not, and the latter was now facing all the recognized problems of supporting a child in her parent's home at the age of eighteen.

(b) *Moral laxity* and reactive anxiety to fornication was the basic problem in 10.

(c) *Frigidity and dyspareunia* in 8 patients were the *causes* and *not* the results of chronic trichomonas vaginitis. Two patients were cured with simple plastic enlargement of the introitus. One, when first seen, had been insufflated by another gynaecologist five days a week for the previous month.

(d) *Divorce and separation*, with resentment, frustration, regret, and depression, characterized the emotional reaction of three unhappy women.

(e) *Chronic domestic strife*, *social dissatisfaction*, *post-partum anxiety*, *religious preoccupation*, were less common, but nevertheless real problems in 18 patients.

(f) *Medical advice*, based on a misunderstanding of the disease, of normal vaginal biology, or of the emotional vicissitudes of women, is the last, but certainly not the least, important aspect of this study. The doctor is not wholly to blame. Each week in his office he reads a new advertisement, or is approached by a drug salesman who hands him samples of the latest cure-all for trichomonas. It is no wonder that he is confused as to the appropriate treatment. It is sometimes the doctor, however, who perpetuates the initial problem with advice such as "It is not a venereal disease, but you may have gotten it from your husband", and finally with the prescribing of a few vaginal suppositories and frequent douches the stage is well set for the patient's disease to become chronic and she then travels from one doctor to the next until frustration is complete. Often it is the "new doctor" who cures these patients. It is not that the particular drug he selects is any better, or that he necessarily has any greater information about the disease. It is simply a fact that he has the time at this stage in his career to get to know his patients better.

Moore and Simpson (1954) in their original paper, suggest, quoting Wolff, "that this association of emotional disturbance and trichomonas vaginitis is a so-called 'protective reaction pattern'." "The mucosal surfaces of the body undergo changes in individuals under stress, characterized by vaso-dilatation, turgescence, and hypersecretion." They note that dermatologists have long appreciated the association of emotional stress and dermatological conditions, and the vagina is certainly stratified squamous epithelium.

This study confirms, in large measure, the paper of Moore and Simpson. Obviously emotional factors are never the whole answer where there is a specific aetiological cause in an organic disease. For some time gynaecologists have had at their disposal many excellent trichomonacidal drugs. If we select those which are adequate to control the primary infestation, search out and remove such local lesions which may be contributing to disturbed vaginal physiology, and, at the same time, recognize and treat the primary emotional disturbance which is characteristic of a large proportion of these patients, our understanding of this disease, and our ability to control it will be immeasurably improved, and the obvious frustration of patient, doctor, and those who write textbooks, will be a thing of the past.

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A CASE OF CONGENITAL OSTEOGENESIS IMPERFECTA VISIBLE ON PRENATAL X-RAY

BY

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THE rarity of this disease in the newly-born child (first described by Vrolik, 1854) and, in our case, its recognition *in utero*, prompt me to publish the following record.

CASE HISTORY

Mrs. L., aged 26 years, gravida-2, had a normal confinement of a healthy male child in January, 1954. The blood group was A Rh negative, without antibodies. Her last menstruation was on 18th June, 1955, the expected date of her delivery thus being 25th March, 1956.

She was first seen on 13th October, 1955, when her uterus was found enlarged to the size of a 15-weeks pregnancy. The pregnancy proceeded normally. On 28th February, 1956 a breech presentation was found and an X-ray suggested. The radiogram taken 3 weeks before term (Fig. 1) showed a single foetus in breech presentation. On first impression the size of the foetus suggested a pregnancy of about 32 weeks, because the bones were still very small and radio-translucent. Most of the bones of the lower extremities were obscured by the mother's sacrum. One of the femora, however, was clearly visible, appearing short, plump, irregularly outlined, and showing at least three fractures. A further fracture seemed to be present in one of the humeri, and perhaps another in the ulna on the same side. The smallness of the bones, the lack of calcium, the general appearance of one femur and the multiple fractures were suggestive of osteogenesis imperfecta. A further remarkable feature was the Buddha attitude of the foetus sometimes found in radiograms of hydrops foetalis.

On 24th March, 1956, a female child was born spontaneously, after a labour lasting 9 hours. It weighed 6 pounds 8 ounces. The most striking features of the child were the short deformed legs and the scanty movements of arms and lower limbs. The head was well-formed, but showed a softening of the left parietal bone. The ears were low set. The sclerotics showed a bluish colour. Investigation of the blood chemistry gave the following values, all within normal limits: serum calcium 10·9 mg. per cent, serum phosphorus 3·8 mg. per cent, alkaline phosphatase 29 units per cent.

An X-ray taken on the second day of life (Fig. 2) showed the long bones of the extremities shortened and translucent. The cortex of these bones was very thin. The most striking pathological changes were present in both femora. They appeared short, plump and wider than normal. There were two fractures in the right femur —one just below the trochanters, another in the lower part of the shaft. In the left femur there were three fractures—two in the midshaft and a third lower down in the metaphysis. Both tibiae showed very wide upper ends, with fractures on both sides. The lower ends of both tibiae and fibulae were bent and there were fractures in the lower ends of the tibiae. Further fractures were found in the necks of both humeri, and in the 10th rib. That these fractures were not of recent origin was shown by the callus-formation which seemed to be excessive in several places.

COMMENT

Fragilitas ossium is regarded as an expression of mesenchymal dysplasia. Other manifestations of this defect are blue sclerotics—also found in our case—stretched tendons, habitual dislocation of joints, translucent skin, otosclerosis and dentine hypoplasia. The osseous manifestations outweigh the others in significance. Histochemical studies show a derangement in the formation of the organic bone-matrix. Its fibres are irregularly arranged. Osteoblasts seem to be scanty and retarded in function, and not capable of forming normal compact bone. The mineral salts show abnormal distribution. Thus it is easy to explain that even the minor traumata to which the foetus is exposed *in utero* may bring about fractures and bending of the bones.

There is overwhelming evidence that osteogenesis imperfecta is an hereditary disease due usually to an autosomal dominant gene. Some cases are subclinical and may be mild enough to

escape detection. The diagnosis of the defect may be suggested solely by the colour of the sclerotics. If an apparently normal person transmits the disease to one or more children the explanation of this fact may be that the effect of the pathological gene is modified by certain biochemical or biophysical factors. In this connexion, we have to consider the role of the endocrine system, as it is known that the parathyroids, pituitary, thyroid, the gonads and the corticosteroids influence the development of the bones.

About one-third of the cases seen in practice give no history of an affected relative. The family history of the described case does not show any member afflicted with fragilitas ossium, although the pedigree is not complete enough to form a conclusive opinion. Such isolated cases might represent the first clinical appearance of a new mutation. Congenital osteogenesis imperfecta is the most severe form. The children are often stillborn or survive only a short time. In our case the child died after 11 months.

Summary

A case of congenital osteogenesis imperfecta is presented in which the diagnosis was made prenatally. The character of the disease is discussed.

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FIG. 1

Prenatal radiogram, showing multiple fractures (indicated by arrows) and structural bony changes.

FIG. 2

Radiogram of infant (second day of life), confirming prenatal diagnosis of osteogenesis imperfecta.

ETHYL BISCOUMACETATE (TROMEXAN) IN HUMAN MILK

BY

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THE excretion of drugs in human milk has been reviewed elsewhere (Illingworth, 1953). Two drugs are known to be excreted in human milk in higher concentration than in serum—thiouracil (Williams, Kay and Jandorf, 1944) and radioactive iodine (Miller and Weetch, 1955). Other drugs excreted in sufficient quantities to affect the baby are bromides, iodides, alcohol, nicotine, barbiturates, ergot, and possibly senna, cascara, rhubarb and aloes (Illingworth, 1953). Phenytoin in human milk has been known to affect a baby (Finch and Lorber, 1954). Pyrimethamine is found in fair concentration in milk (Clyde, Shute and Press, 1956). Antibiotics and other drugs are excreted in such small quantities that they have no effect on the baby.

For some years anticoagulant drugs have been administered to mothers with post-operative thromboses, and breast feeding was allowed to continue. In 1954, however, Christ made the alarming statement that "Tromexan and other dicoumarin derivatives should not be given to puerperal women who are feeding their babies". He wrote "These substances pass readily into the milk, and may affect the infant at a time when the prothrombin index is already low. Liver damage may result and this has been observed in 2 of the author's cases." Christ did not provide evidence that the so-called liver damage was in any way due to the anti-coagulant, or that the baby's prothrombin time was affected by breast milk from a mother receiving anticoagulants. On the other hand Aeppli and Pulver (1954) found that the amount of Tromexan in human milk was too small to affect the baby, and found that the baby's prothrombin time was unaffected.

In view of the routine use of Tromexan and allied drugs in the treatment of puerperal thromboses at Sheffield, we decided to determine Tromexan levels in the milk of mothers receiving the drug, and to observe the clinical effect, if any, on the babies.

Method of Study

We estimated the Tromexan level in 38 specimens of milk from 4 mothers. The milk was obtained by manual expression at varying times after the last dose of Tromexan. In all cases the time of administration of the drug and of expressing the milk was recorded. The dose given to the mothers varied from 600 to 1,200 mg. per day for an average of 13 days (range 6 to 19). In addition heparin was given to several of these mothers in the first 24 hours, the usual dose being 15,000 to 40,000 units. The method of Brodie *et al.* (1952) was used.

Fourteen babies were fully breast fed during Tromexan therapy; a further 8 babies received small complementary feeds during part of the treatment. All the babies were carefully observed

during the treatment, but we did not consider that it was ethical to obtain specimens of blood from the babies for prothrombin time estimations or liver function tests.

The Method of Estimating Tromexan

Six ml. breast milk were acidified with 1 ml. 2 N. hydrochloric acid and shaken for 30 minutes in a mechanical shaker with 20 ml. heptane containing 3 per cent isoamyl alcohol. After standing 30 minutes, 15 ml. of the heptane phase were transferred to a glass stoppered tube: 5 ml. 2·5 N. caustic soda were added and the tube was shaken for 5 minutes. After centrifugation, about 3 ml. of the aqueous phase were transferred to a 10 mm. quartz cuvette and the extinction value was read at 310 mμ in a Hilger spectrophotometer.

Standards were prepared similarly from pure Tromexan dissolved in 0·1 N. caustic soda.

Results

None of the babies showed any adverse effect. Weight gain was normal. There were no abnormal physical signs. There was no hepatic enlargement or haemorrhage manifestation in any.

The Tromexan estimations were as follows:

Case 1. 12 specimens. No Tromexan in 11 specimens; 9 μg. per 100 ml. in one.

Case 2. 7 specimens. Mean concentration 112 μg.; range 63–169 μg. per 100 ml.

Case 3. 8 specimens. None in 6; 18 and 62 μg. per 100 ml. respectively in the other two.

Case 4. 11 specimens. None in eight; 35·8, 41·0 and 89·0 μg. per 100 ml. respectively in three.

We could detect no correlation between the concentration in the milk and the dosage or time of administration of Tromexan to the mother.

Discussion

We found no evidence that Tromexan given to lactating mothers affected the babies through the breast milk. In view of the very small quantities excreted in the milk, it is exceedingly unlikely that a baby would be affected. Brodie *et al.* (1952) studied the serum levels of Tromexan in women at varying times after administration, and found average peak levels of 25 mg. per litre, the range being 27 to 145 mg. per litre. In the 38 specimens of milk examined by us, collected at varying intervals after administration of full doses of the drug, the highest concentration was 169 micrograms per 100 ml. Such a low concentration would not be expected to affect a baby.

Summary

Twenty-two breast fed babies received milk from mothers receiving ethyl biscoumacetate (Tromexan). None were adversely affected. Only small quantities of the drug were found in 13 of 38 specimens of milk, and none in the remaining 25 specimens. It is concluded that we found no evidence that Tromexan administered to a lactating woman is dangerous to the baby.

Acknowledgments

We wish to thank Sister O'Neill for her invaluable co-operation in this study, and to Geigy Pharmaceuticals for the supply of the Tromexan active ingredient.

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PROPHYLACTIC CERVICAL LIGATION

A Case Report

BY

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A METHOD of diagnosis and management of miscarriage occurring in the middle trimester of pregnancy has been reported by McDonald (1957). The responsible lesion, "cervical incompetence", occurs as an acquired or congenital defect. The possibility of prophylactic ligation of the cervix was not discussed in this paper; but such a procedure may have a place in acquired incompetence due to trauma. Cases of recurrent miscarriage due to severe cervical trauma would seem to be the most suitable for this technique.

McDonald clearly indicated that these patients act as their own controls. They follow a pattern by exhibiting repeated miscarriage at about 20 to 24 weeks of gestation. Delivery at about 35 weeks usually follows successful ligation.

In dealing with such a case two variations in technique may be mentioned: (1) repeated ligation if necessary; (2) the use of mattress sutures instead of, or in association with, the purse string suture.

CASE REPORT

On 16th September, 1956, Mrs. S., aged 22 years, a trained nurse, was referred because of two miscarriages. Seventeen months after marriage she conceived. At two months gestation, after a manual reposition of the uterus under general anaesthesia, a slight vaginal blood loss occurred. When 24 weeks pregnant premature labour began. Some hours after admission to hospital, a leg was found protruding through the cervix and the foetus was delivered by forcible breech extraction. The foetus was macroscopically normal. One year later she "suddenly" aborted at 12 weeks of gestation. A vague lower abdominal pain had been followed by a slight show, and the passage of the foetus. After both pregnancies she had been curetted and the cervix had been cauterized.

She was a normal healthy young woman whose only positive finding was seen at vaginal examination. The cervix showed a large stellate laceration, having a long posterior limb extending into the posterior vaginal fornix for a distance of 1½ to 2 inches. The cervix was eroded and showed extensive scarring about the healed laceration. The external os admitted a finger tip (Fig. 1).

FIG. 1

The appearance of the cervix at speculum examination.

She was advised to return immediately she became pregnant.

On 7th February, 1957, she reported stating her last normal menstrual period had occurred on 28th December, 1956. The uterus was soft, bulky and freely mobile. At three months of pregnancy a purse string suture of Number 4 Mersilk was inserted about the cervix. At 20-weeks gestation the patient noticed a feeling of fullness in the lower abdomen with an associated thick mucous vaginal discharge. Examination showed the purse string had cut out posteriorly where there was minimal cervical tissue, and the cervix admitted a finger. Under anaesthesia two purse strings were inserted, one above the other. These two sutures cut out on 13th June, 1957, and the symptom-sequence recurred. At the third attempt to save the pregnancy three mattress sutures and one purse string were inserted, a finger in the cervix acting both as a guide and to keep the bulging membranes clear. Ten days later a plain X-ray of the abdomen showed a normal foetal skeleton.

She was admitted in established labour at 34 weeks with all the sutures cut out. After a temporary quiescence, labour commenced suddenly at 3.30 a.m. on the day following admission. At 4.05 a.m. the membranes ruptured. At 4.12 a.m. a male child was delivered after a generous episiotomy. The baby was well and now is a normal child of 10 months.

Comment

It seems clear this pregnancy would not have had a successful outcome without repeated cervical ligations.

There was adequate evidence of severe cervical trauma, and the second miscarriage was typical of "cervical incompetence".

The final onset of labour, with a rapid delivery at 35 weeks is in keeping with McDonald's figures.

Summary

(1) A case of prophylactic cervical ligation with a successful conclusion is presented.

(2) Cases of severe cervical trauma are thought suitable for prophylactic ligation.

(3) Mattress sutures may be more efficient than the purse string in such cases.

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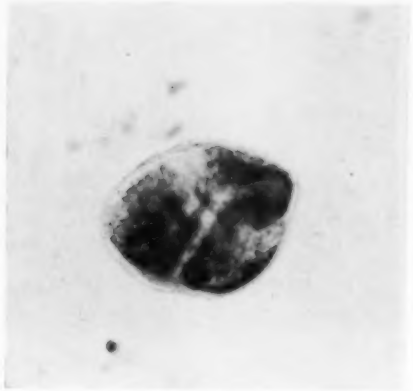

FIG. 1

Four cell fertilized human ovum found in a routine vaginal smear. ×400.

A HUMAN OVUM IN A VAGINAL SMEAR

BY

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AND

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THE finding of a fertilized ovum in a vaginal smear appears to be one of great rarity. According to Mrs. Ruth Graham in all her extensive cytological experience she has never encountered an ovum.

The accompanying plate shows a four cell ovum surrounded by a well marked zona pellucida. Owing to the size of the ovum only three divisions show clearly in the photograph.

The patient, Mrs. M.C., aged 42, attended the Gynaecological Out-Patient Department on 10th July, 1958 when she consulted Mr. David Smith on account of cystocele and rectocele. Her last menstrual period was in May, 1958 and apart from cystocele and rectocele no pelvic abnormality was discovered. A routine vaginal smear was submitted to our laboratory and in it we discovered the ovum illustrated in the photograph. Apart from this finding the smear was normal.

We are indebted to Dr. Alfred Glucksmann and Mr. George Lenny of Strangeways Research Laboratory, Cambridge, for the photograph.

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AN INFANT RESUSCITATION TROLLEY

BY

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IT was decided to construct a trolley for the reception of the newborn baby which would be readily movable and would embody mechanisms for the administration of oxygen and for suction.

The trolley itself presented no difficulty and was rescued from a seldom frequented corner of the hospital stores. To the top frame was fitted a wooden "cot" with an inclined plane on which could rest a hard pillow. The front end was made to let down, giving easy access to the head of the baby should endotracheal intubation be necessary.

The base of the "cot" was attached in front to the top transverse member of the trolley frame by means of hinges, while the sides were attached to the lateral members by means of adjustable metal strips fastened by means of a screw and winged nut. By this means, the plane of the "cot", as a whole, could be varied.

From the two top lateral members of the trolley were slung two cages, each to carry an oxygen cylinder; these cages were welded in the hospital engineer's shop. One oxygen cylinder carried an Adams and the other a McKesson reducing valve. To the bottom members of the trolley a wooden shelf with a short wall was fitted, and on this drugs, catheters, a laryngoscope, etc., can be kept.

Beneath the "cot" in front of the trolley, and attached to the trolley frame, a control panel of sheet aluminium was fixed. To it was attached an oxygen "Rotameter" unit. A rubber tube led from the Adams valve to the proximal end of this unit, and from the distal end a tube led to a two-way tap also mounted on the panel. (This tap was adapted by the local firm of instrument makers.) To one opening of the tap was fitted a McIlroy oxygen funnel and to the other a piece of rubber tubing with an attachment to join with either the double tube for the administration of endogastric oxygen or an endotracheal catheter.

Also attached to the panel is the suction apparatus. This consists of the small Venturi unit which is embodied in the "Comprex" anaesthetic apparatus made by the Medical and Industrial Equipment Co., Ltd. Tubing leads from the McKesson valve to the proximal opening of the unit, and from the distal opening tubing leads to a suction reservoir bottle. The control knob is in front of the panel. From the bottle the suction tube is led off and to it is joined a mount for the catheter which is used on the infant.

This trolley, in its various stages of development, has been used in the Obstetric Unit at the Leicester General Hospital for the last five years, and assurance has been given by the obstetricians that they have found it of very great help indeed.

A commercial model of the above apparatus is being made by the Medical and Industrial Equipment Co., Ltd., and will shortly be available. To this there are certain refinements which include contents gauges for both oxygen cylinders, a vacuum gauge for the suction unit which is of an improved type, and accommodation for larger cylinders. A safety valve set to "blow" at 30 cm. of water is to be embodied in the oxygen system.

Photographs of the "home-made" model and of the prototype of the commercial model are shown (Figs. 1 and 2).

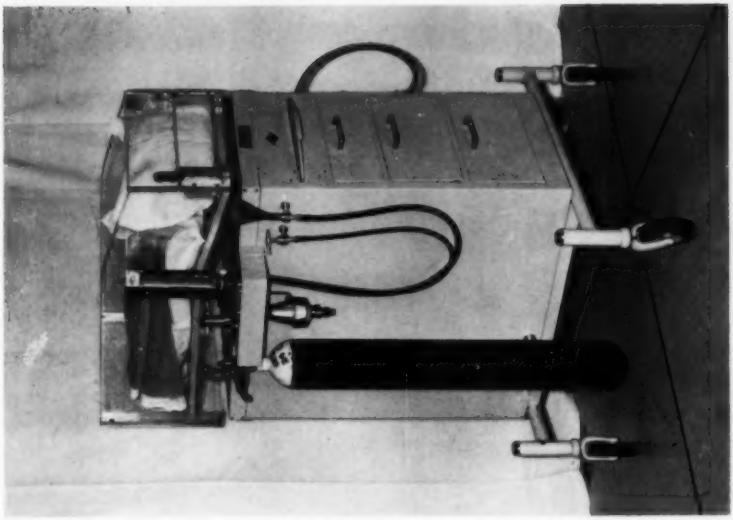

FIG. 2
The commercial model (prototype).

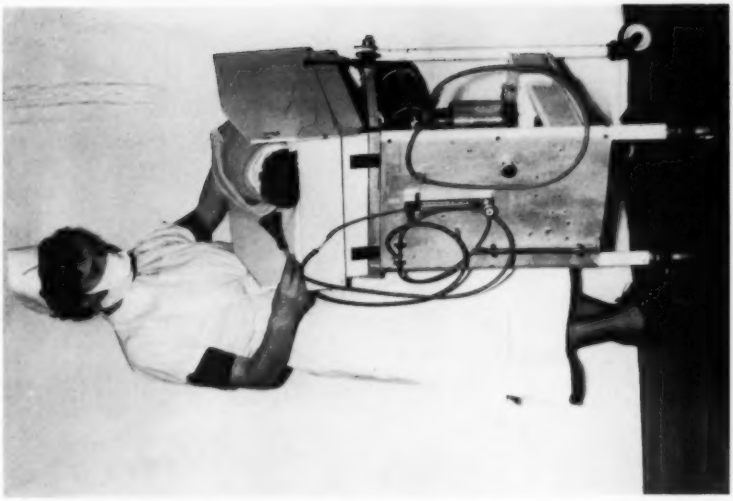

FIG. 1
The hospital-made model.

By courtesy of Elliott & Fry, Ltd.

H. H. FOURACRE BARNS

Obituary

H. H. FOURACRE BARNS

M.B., B.S., F.R.C.S., F.R.C.O.G.

H. H. FOURACRE BARNS received his medical education at University College and University College Hospital. Straight away he proved his mental ability to be above average, for in the College he won both the junior and senior medals in anatomy and the silver medal in embryology and histology.

At U.C.H. he maintained this high standard, being awarded the Fellowes silver medal in medicine and the F. T. Roberts prize in obstetrics. He qualified M.R.C.S., L.R.C.P. in 1935 and graduated M.B., B.S. in 1936. He then set about the F.R.C.S. and at a Fellowship course he met Miss Doreen Forrester; both became F.R.C.S. in 1939 and celebrated this dual success by marriage.

Fouracre Barns was House Physician to Dr. McNee and House Surgeon to Mr. Julian Taylor at U.C.H. and during these appointments proved his clinical work to be of the same high standard as the more academic side of his early career. He then decided to specialize in obstetrics and gynaecology, eventually becoming Obstetric Registrar and later First Assistant to the Obstetric Unit. During the war he served with the R.A.F. as a surgical and gynaecological specialist, reaching the rank of Squadron Leader. He took the M.R.C.O.G. in 1942 and was elected to the Fellowship in 1953.

On demobilization he was appointed Chief Assistant to the department of Obstetrics and Gynaecology at St. Thomas's Hospital, and soon was elected to the Consultant Staff of the Hospital for Women, Soho Square and Queen Mary's Hospital, Stratford. He also became a Consultant Gynaecologist to the Ministry of Pensions and examiner for the Conjoint Board, the University of London, the Central Midwives Board and the General Nursing Council. A successful consulting practice was by now established, but all this was insufficient for his acute and active mind. He became intensely interested in the problems associated with diabetes and pregnancy and in those concerning infertility, and did much good laboratory as well as clinical research in these fields. He also devised several operative techniques and took excellent films to illustrate them.

All this is but a catalogue of his main achievements and, apart from indicating the quality of his mind, tells the reader nothing of the character of the man himself. So far, the writer's task has been simple and he acknowledges that most of the above has been copied from the *British Medical Journal* of 31st January. To give a vivid impression of the personality concerned is far more formidable. Obituaries generally give the impression that those who are dead were saints, which is nonsense. Fouracre Barns had some aggravating mannerisms (who hasn't?) but he had many sterling qualities amongst which spontaneous generosity, thoughtfulness for others and reliability, were to the fore. He was "Harry" to all his friends, and to his patients (to whom he rapidly became a friend). When I was ill for many months he visited me regularly and quietly looked after much of my private practice. On returning to work I found he had paid into my bank considerable sums of money—which he had worked for, but which he felt belonged to me. Such was his generosity. He knew of pain himself. He underwent two

major operations for spondylolisthesis—taught himself to do abdomino-pelvic operations when sitting—thus relieving the chronic pain in his back. Car driving increased his pain so he devised a car seat which it is understood will be in production in the near future.

In spite of the handicap of chronic pain he enjoyed playing golf and squash. He was invariably cheerful and punctual. His knowledge of his speciality was deep. One could always rely upon his advice being well reasoned and sincere. Harry was no "Yes" man. He had the courage of his own convictions—all the more to his credit.

He was a good teacher and gave up most of his Saturday mornings to giving rag classes to students. He had the gift of imparting knowledge as well as absorbing it. Already he has added valuable contributions to the literature, and had he lived longer would have undoubtedly given many more.

Apart from his almost illegible hand writing, his case records are a model, with a careful follow-up of all cases, labelled and cross indexed. He was learning by his experience and recording it for future use.

I have still failed to give an impression of Harry, stocky in build, dark wavy hair, his "I see old boy but . . ." only those who really knew him well understand what I mean.

In 23 years as a doctor, Harry achieved much. He had also made many real friends. As has been said elsewhere, to die at the early age of 48 years when the next 15 years held out such promise of further achievement, is a loss to medicine second only to the tragedy suffered by his widow Doreen and son Nick to whom he was exceedingly devoted and they to him.

J. D. FLEW.

ROYAL COLLEGE OF OBSTETRICIANS AND GYNAECOLOGISTS

AT the Meeting of Council held in the College House on Saturday, 23rd May, 1959, with the President, Professor A. M. Claye, in the Chair, the following were elected to Council to fill statutory vacancies:

As representatives of the **Fellows:**

LONDON	Humphrey George Edgar Arthure.
ENGLAND AND WALES (excluding London) ..	William Hawksworth. Harold Jordan Malkin.
SCOTLAND	Hector Ross MacLennan.
NORTHERN IRELAND AND EIRE	Ninian McIntire Falkiner.

As representatives of the **Members:**

ENGLAND AND WALES (excluding London) ..	Dorothy Margaret Shotton.
SCOTLAND	Matthew Macmaster Garrey.

Dr. T. F. Corkill of Wellington, New Zealand was appointed Sims-Black Travelling Professor for 1960 to visit the British Isles.

The following were admitted to the **Fellowship:**

Bruce Hunter Anderson.
Segulla Jacob Aptekar.
Hugh Rose Arthur.
Solomon Bender.
Bryce Evans Blair.
Grace Johnston Cuthbert Browne.
James Edward Scott Carmichael.
Douglas George Wilson Clyne.
John Barr Cochrane.
Sidney Joel Cohen.
James McDiarmid Corston.
Derk Crichton.
George Laurence Daly.
Josephine Alice Davidson.
Llewellyn Mervyn Edwards.
Harold Hugh Francis.
Ian Tuke Fraser.
Sadashiv Narayan Gardé.
Frans Gert Geldenhuys.
Bruce Walton Grieve.
William James Hamilton.
Robert Leighton Hartley.
John Richard Edwin James.
Wilbur Francis Joynt.
Jadwiga Karnicki.
Robert Arthur Hugh Kinch.
Katharine Isabel Liebert.
Ethna West Little.
James Lorne Macarthur.
John Malcolm McBride.
Ian MacGillivray.
John Sinclair MacVine.
Agnes Macfarlane Duncan Milne.
Charles Rutherford Morison.
Norman Frederick Morris.
John Murray.
Naizby Noble.
Dwijendra Lal Poddar.
Louis James Quinn.
Theodore Francis Redman.
Richard Xerxes Sands.
Kenneth Garratt Seager.
Malcolm James Lees Stening.
Elsie May Terry.
Philip Cedric Thomas.

The following were admitted to the **Membership:**

Ernest Aldous-Ball.
Keith Reginald Barnes.
Solomon Leonard Barron.
Kamala Bose.
John Andrew Carron Brown.
Enid Menary Carey.
Kalyani Chatterjee.
Ki-Kit Chow.

Sydney Cohen.
Kenneth Veitch Cooper.
Mohini Dass.
George Marshall Davidson.
Bruce Hamilton Dawson.
Suryamoni Devi.
Rita Deidre Dickinson.
Piyatissa Dissanayake.
Peter Mervyn Elliott.
Robert Graham Emerson.
Bryan Nelson Foy.
Robert Donald Fraser.
Irene Clara Hain.
Julian Joseph Handler.
Shaukat Haroon.
Jeffery Gould Harrington.
Sakti Ram Hazra.
Michael Howett.
Reginald Fourseth Hutchings.
Sheila Anne Martyn.
Bimla Mehra.
John James Morrissey.
Harold Mukheiber.
Saputahawattege Henry Piyadasa Nanayakkara.
Ivan Orr.
Raymond John Ostolosky.
John Francis O'Sullivan.
Keki Dinshaw Printer.
Michael Arthur Pugh.
Saroja Ramaswamy.
Carmen Mary Rant.
Ann Lea Reynolds.
Jayatissa Nalin Rodrigo.
Malti Rohatgi.
Rita Winifred Shannon.
David Hamilton Stewart.
Walter Siang Hwa Tow.
Margaret Anne Wignall.

List of Candidates who have been awarded the **Diploma in Obstetrics:**

Peter Joseph Adams.
Kenneth David Allardyce.
Charles John Allen.
David Laurence Almond.
Mary Margaret Anderson.
Patrick Campbell Whately Anderson.
Antoni Zbigniew Andrzejowski.
Anthony Russell Archer.
Anthony Hewitt Atkinson.
Kingsley David Austin.
Sheila Bajpai.
Kenneth Barker.
Colin Sinclair Barton.
John Reginald Dawson Bedford.
Norman Beenstock.
Philip John Bennison.
John Anthony Bessell.
Anthea Blofeld.
Allan Eric Bloomfield.
Alan Richard Bone.
Gordon Alexander Wotherspoon Borland.
Terence Alyn Boxall.
Keith Wilfred Braybon.
Douglas Scott Campbell Brown.
Eric William John Brown.
Margaret Brown.
John Renwick Brunton.
Anthony George Bryer.
James Glen Stewart Buchanan.
Jill Marjorie Buddin.
George David Burnett.
Peter John Burnett.
Bruce Hosegood Burns.
Margaret Elizabeth Burns.
John Leonard Halford Capper.
Roland Pitman Carrington.
Thomas Burney Catnach.
Chandrabala Chaurasia.
John Houghton Chippendale.
George Miles Clark.
Gordon Angus Clark.
Gertrude Anne Collie-Kolibabka.
Jean Ross Colston.
Stanley James Cooper.
William Locking Cordeaux.
Andrew William Mitchell Core.
David William Couch.
Brian Stephen Cox.
Frank Cramer.
Douglas Cresswell.
John Barrie St.Clair Cumberbatch.
Peter Curzen.
Timothy Ekundayo Dada.
Thomas Charles Dann.
David Watkin Davies.
Gerald Leighton Davies.
John Frederick Henry Deeble.
Brian Patrick Dillon.
Kaushlya Dodeja.
Margaret Elizabeth Dodson.
Gerald Vincent Donaghy.
Ivor Ernest Doney.
Eric Murray Douglas.
Ernest Victor Dulson.
Edna Margaret Dumbell.
Mair Angharad Edwards.
Vivian Georgina Edwards.
David Meredyth Entwistle.
Elizabeth Eleanor Evans.
Donald Andrew Ewing.
George Reginald Fenton.
Robert Somerled Cameron Fergusson.
John Watt Fisher.
Cecil Victor Foll.
Robert Duncan Forbes.
William Raymond Forbes.
John Maurice Foster.
John Gwilym Francis.

Campbell Robertson Frazer.
George Bernard Gasson.
Lino John German.
Sydney Dennis Giddy.
Robert Adam Sampson Gilchrist.
Leonard Henry Glaser.
Norman Gorbutt.
John Nigel Graham-Evans.
Edwin Saviour Grech.
Alfred James Graham Griffin.
Michael Thomas Frederick Griffiths.
Graham Gripton.
Colin Gunn.
Cicely Roffway Haines.
James Gerald Hall.
John Mervyn Halpe.
Ramsay Hannah.
Anthony James Harbott.
John Hardy.
Sylvie Mary Harrison.
Michael Woods Haslett.
Compton Neville Haynes.
Joyce Rose Hayter.
Michael John Hill.
Keith Longsworth Hindle.
Michael Norman Hirons.
Leslie John Hobbs.
Edwin Lionel Holland.
Hugh Jackson Houston.
John William Gildas Hughes.
John Howard Casson Hunt.
John William Hunt.
Rosemary Joan Huntley.
George David Hurrell.
Robin Charles Ilbert.
Pilloo Khoodyar Irani.
Hannah Eva Jacoby.
David Jarratt.
Michael Charles Johnson.
Barbara Dilys Jones.
Kenneth Jones.
Michael Kennedy.
Colin William Kerr.
Peter Neville Kersley.
Othmar John Kiener.
James Ian King.
Ma Hla Kyi.
Khin Than Kywe.
David Waring Laurie.
Monty Harold Lawrence.
Maimoon Mohamed Lebbe.
John Wilfred Smith Lee.
John Vyvyan Vaughan Lewis.
Hans Eugen Lichtenstein.
David Charles Linahan.
Christobel Helen Lomax.
John Edward Ross Lorimer.
Elizabeth Margaret McMurray Love.
Emanuel Graham Lucas.
William Lindsay MacIndoe.
Garrett Gerard McGarry.
Robert McLean.
Charles James Macaulay.
James Campbell Mackenzie.
Ian Wilson Manson.
Khursheed Homi Marolia.
Christopher David May.
Marie Joseph Albert Menage.
Ian Crerar Menzies.
John Desmond Miller.
William Robert Moore.
Robert Charles Mulholland.
Anthony Patrick Murphy.
Vidyasagar Nagpal.
David Yeates Nelson.
Grace Elizabeth Nicholls.
Alister Macgregor Nisbet.
Christopher Henry Nourse.
Florence Yokhaybaith Obadiah.
Francis Terence O'Brien.
Antoinette Patricia Barbara O'Donnell.
Brendan Kevin O'Farrell.
David Robert John Parrott.
Dennis Willoughby Patient.
Christine Pattie.
Ethel Pereira.
Paul Phellas.
David Harry Pickett.
Frederick John Pickworth.
John Salisbury Raban.
John Laurence Ramsay.
Gordon Allard Reed.
John Matheson Ritchie.
Pamela Ann Roberton.
Edward Reginald Roberts.
James Roberts.
Melvyn Roland Griffiths Robinson.
Lewis Craig Rose.
Ian Ross Russell.
Gwyn Rowlands.
Dilip Kumar Roy.
Colin Stuart Kenneth Ruck.
William Banks Russell.
John Alexander Shanks.
Kodathoore Shamba Shetty.
Michael Silver.
Michael Norman Simmonds.
Maurice William James Smith.
Richard Dennis Smith.
John Gordon Spink.
Gordon Philip St. Chad Starck.
Roger Hugh Stearn.
Jessie Millar Steele.
Robert George Strachan.
Cecil Duncan Strang.
David Radcliffe Metcalfe Stuart.
Philip Edward Norman Suter.
Seana Rowan Sutherland.
Gaius Backholer Sutton.
Stanley Grahame Sutton.
Hugh Malcolm Swallow.
Graham Roger Swift.

John Alphonsus Taaffe.
John Frederick Taylor.
Stephen Anselm Willis Taylor.
Adrian Llewellyn Thomas.
Kelly Thomas Tighe.
Keith Burleigh Tyrer.
Claudine Margaret Tyson.
Richard Martin Wainwright.
Alexander Kirkland Walker.
John Greves Wall.
Rosemary Wall.
Barbara Jane West.
Jonathan Joly McLaren West.
Michael Selbourne Whitehouse.
Peter Douglas Wickenden.
June Muriel Wilby.
David Owen Williams.
John Holman Bentley Williams.
Meriel Williams.
Thomas Magor Winstanley.
Raymond Winstone.
James Fairley Wood.
Albert Kenneth Woodward.
Stanley Michael Worrall.
Michael Joseph Wright.

INTERNATIONAL SOCIETY OF GEOGRAPHICAL PATHOLOGY

MEETING IN LONDON, JUNE, 1960

Subject: ECLAMPSIA AND PRE-ECLAMPSIA

ATTENTION of Obstetricians and Gynaecologists is drawn to the above meeting and it is hoped that this will be strongly supported.

The British National Committee is responsible for the organization and financing of this meeting. The Committee includes representatives from the Royal College of Obstetricians and Gynaecologists.

Subscriptions to the Society (24*s.*) should be sent to the Hon. Treasurer, Professor G. J. Cunningham, Royal College of Surgeons, Lincoln's Inn Fields, London, W.C.2.

HOSPITAL REPORTS

BY

J. S. TOMKINSON, M.B., F.R.C.S., M.R.C.O.G.

THE CLINICAL REPORT OF THE DEPARTMENT OF OBSTETRICS, MAKERERE COLLEGE MEDICAL SCHOOL, KAMPALA, UGANDA, FOR THE YEARS 1953, 1954 AND 1955

FOR those who seek "blood, toil, tears and sweat" in obstetrics—here is a well written account; one reads it humbly, chastened by the difficulties encountered. This is the first report of the Maternity Department at Mulago Hospital, Kampala, the teaching school for medical students from Makerere College (University College of East Africa) and a training school for nurses and midwives taking the local (Uganda) certificate. Owned and financed by the Uganda Protectorate Government, it is staffed partly by the Makerere College Medical School and partly by the Government Medical Service. The hospital is for Africans only and is situated practically on the Equator at a height of 4,000 feet.

The department had 65 obstetric and 25 gynaecological beds. During the three years reported, 5,137 patients were delivered, a further 361 patients were admitted after delivery and 1,032 abortions were dealt with. There were 78 maternal deaths (11·93 per 1,000 total admissions); the stillbirth rate was 82·1 per 1,000 total births and the neonatal death rate was 42·3 per 1,000 live births. Because no patient was ever turned away for delivery, patients were sometimes nursed and delivered on the floor and if normal sent home after forty-eight hours, but the aim was to keep mothers in for five or six days.

The introduction to the report gives an account of the patients' background, their customs, dress, diet, marital habits and commoner diseases. Many of the patients are deficient in proteins "as, these are said to make women —but not men!—sterile". The incidence of venereal disease is high; pulmonary tuberculosis is definitely on the increase. There is the usual difficulty in dealing with a primitive community in getting patients to attend antenatal and infant welfare clinics; many patients wait at home to see if they will have a normal delivery, they are vague about the number of previous abortions and deliveries, the length of time in labour, their menstrual periods.

The report states that the nursing standard was low compared with that of the United Kingdom, not all the nurses could speak English and they found difficulty in recording time and clinical details such as the foetal heart rate.

The report follows for the most part the recommendations of the Standard Maternity Hospital Report Committee of the Royal College of Obstetricians and Gynaecologists; some tables are omitted, as, for example, the table on contracted pelvis because the majority of the patients have a very small generally contracted pelvis (also very shallow) and the table on prolonged labour because primary uterine inertia was rare and also because of the difficulty of patients and nurses in estimating time. The Makerere College Library printed the report and they should be congratulated on the clarity of the print, the excellence of the paper and binding and on the absence of typographic mistakes, the latter unfortunately all too frequent in reports from the United Kingdom.

Both pre-eclampsia and eclampsia were rare and when they did occur they were of sudden onset; 3 out of 14 mothers died of eclampsia, half the babies surviving. Multiple pregnancies were very common and welcomed by the patients; the total of 123 cases in the 3 years gives an incidence of 2·39 per cent of all deliveries. One other, with triplets, died. Seventy-seven per cent of the babies left the hospital alive and well.

Labour following Caesarean section occurred in 278 of cases, an incidence of 5·4 per cent of all deliveries. Usually the previous section had been done because of disproportion, but often the patient did not know why and in hardly any instances were the old case notes available. The number of normal deliveries obtained was 120 and 121 Caesarean sections were performed; 13 of the patients ruptured their uterus. This was treated by hysterectomy 9 times and by repair of the scar in 4 cases.

Ten deaths occurred from retained placenta and post-partum haemorrhage out of a total of 60, all being admitted from outside; these patients usually arrived at the hospital exsanguinated and unfortunately blood was often not available for resuscitation. Six patients died from post-partum haemorrhage, all delivered in hospital. The Caesarean section rate was 5·16 per cent, the commonest indication being disproportion after a trial of labour. The incidence of forceps delivery was 5·53 per cent. Thirty-four cases of uterine rupture were treated, with 11 maternal deaths; some of these cases are probably due to infusions of native herbs which when applied to experimental rabbits' uterine muscle cause a tetanic type of response.

A Paediatric Report is included but the comment is made that some of the tables are misleading because patients are often discharged soon after delivery and in the case of stillbirths and neonatal deaths the diagnosis is hampered by the frequent refusal for a post-mortem examination.

The Department of Obstetrics at Makerere College Medical School is to be congratulated on the accuracy, interest and instruction displayed in its first report. One looks forward to seeing the next three years report.

THE CLINICAL REPORT OF THE CRESSWELL MATERNITY HOSPITAL, DUMFRIES, FOR 1956

THIS report follows closely the recommendations of the Royal College's Standard Maternity Hospital Report Committee. There is a numerical summary of the year's work but no table of comparative analysis with previous years. A total of 1,568 patients were delivered, of whom 215 were unbooked cases. Twelve cases of hyperemesis gravidarum were admitted; one case required hysterotomy. The incidence of pre-eclamptic toxaemia was 10·8 per cent and 5 cases of eclampsia were treated; 3 of these were in non-booked patients (of these 3, 2 were before the 28th week of pregnancy and both aborted spontaneously). The foetal loss in uncomplicated breech deliveries was 5·8 per cent stillbirths in primigravidae and 6·2 per cent in multigravidae. A labour following previous Caesarean section occurred in 22 patients and a vaginal delivery was obtained in 13. One patient ruptured her uterus after a previous classical section; a Caesarean hysterectomy was performed. The post-partum haemorrhage rate was 1·8 per cent and no maternal death occurred from this complication. The incidence of manual removal was 1·5 per cent; of Caesarean section 2·6 per cent and of forceps delivery 7·8 per cent. Only 13 patients were surgically induced and in 4 instances there was gross foetal abnormality.

One maternal death occurred due to a pulmonary embolus thirteen days after an elective classical Caesarean section in a patient aged 36 who had had 2 previous classical sections.

THE MEDICAL AND CLINICAL REPORT OF THE ROYAL WOMEN'S HOSPITAL, MELBOURNE, AUSTRALIA, FROM 1ST JULY, 1955 TO 31ST DECEMBER, 1956

THIS report is for eighteen months, from mid-1955 to the end of 1956, so that the next report may conform to the calendar. A comprehensive account is given of the obstetrical and gynaecological work of the hospital. The introduction of xiv pages includes a description of the medical organization of the hospital, the index and a statistical summary. The obstetric report follows the modern tendency to condense the details of the tables recommended by the Standard Maternity Hospital Report Committee of the Royal College so that a short summary of each table is given with a defining and descriptive heading which makes for easier and quicker abstraction of the essentials of each table and also for speedy publication.

The hospital had 313 beds for obstetrics, but 174 of these were outside the hospital and were for postnatal care, the mother and baby being transferred on the second day following delivery and remaining under the care of the hospital staff. This arrangement means that better use is made of the main hospital beds and the patients benefit by being in more tranquil surroundings with greater advantages for seeing their visitors and other children. These facilities enabled the hospital to deliver 6,551 patients in twelve calendar months 1955–1956. Four patients died (two being unbooked). The stillbirth rate was 18·2 per thousand and the neonatal death rate was 14·0 per thousand; the perinatal mortality was 23·1 per thousand in booked cases and 151·6 per thousand in non-booked cases.

The commonest associated disease in pregnancy was anaemia, diagnosed when the haemoglobin was below 12 grammes per litre. During a year 39 cases of diabetes were delivered (55 per cent by Caesarean section) with the excellent result of a foetal wastage of only 13 per cent. During the same time 12 cases of eclampsia were treated (8 in non-booked patients) with foetal loss of 16·6 per cent. In uncomplicated breech deliveries the foetal loss rate was 3 per cent for primigravidae and 6 per cent for multigravidae. Labour following previous Caesarean section was managed in 147 cases and 31 per cent had a vaginal delivery; there were 2 ruptures of the scar. One treated by section and repair of the lower segment and the other by hysterectomy after a vaginal delivery of a brow presentation.

The incidence of post-partum haemorrhage during the year was 3·1 per cent. Ergometrine was used routinely in the third stage of labour as follows: 0·5 mg. intravenously as soon after delivery of the baby as possible followed by 0·5 mg. intramuscularly when the placenta is delivered. There was a rise in the incidence of post-partum haemorrhage from 2·5 per cent in 1954–55 to 3·1 per cent in 1955–56. A manual removal of the placenta was performed in 70 out of 222 of these cases. The Caesarean section rate was 3·9 per cent in booked cases (without a maternal death in 326 patients so delivered). The forceps delivery rate was 8·2 per cent, the same as the previous year. No cases of special interest are described. There is a paediatric report.

Five gynaecological units work in the hospital, each unit having twenty-four beds and some after-care beds outside the hospital; one of these units is staffed by the Professorial department of Obstetrics and Gynaecology in the University of Melbourne. From three units patients with carcinoma of the uterus are referred to the Radio-surgical unit, a combined radiotherapeutic and surgical unit. No cases of special interest are selected for narration.

BOOK REVIEWS

'Obstetric and Gynecologic Milestones—Essays in Eponymy." By HAROLD SPEERT, M.D., Assistant Professor of Clinical Obstetrics and Gynecology, Columbia University, U.S.A. Pp. 700, illustrated. Macmillan, New York and London, 1958. Price 105*s*.

TEST your knowledge of the history of eponymous obstetrics and gynaecology. (1) What was a "pisse-prophet"? (2) Why is "fallopian" a mis-spelling? (3) What had Call (Call-Exner bodies) and Nitabuch (Nitabuch's layer) in common? (4) What did Krukenberg consider the pathology of Krukenberg tumours? (5) Who is said to have introduced rubber gloves to obstetric practice? (6) Which is the only ovarian tumour having no pathological designation other than its eponym? (7) Who gave his name to an ovarian tumour, left Europe for another continent, is now a general practitioner, and was unaware until recently that his name is appended to the tumour? (8) What are the three eponymous contributions of Naegele? (9) In which country was Bartholin born? (10) Who left an elaborately bound volume as his last medical testament, with all the pages blank save one, and on that one had written "Keep the head cool, the feet warm and the bowels open"?

The answers are given in the footnote below,* but the reader is better advised to buy or borrow Dr. Speert's delightful volume of essays in eponymy, only the minority of which have been previously published (including a few in this Journal). Dr. Speert has liberally interspersed his text with extracts and illustrations from the original articles, so that the reader assimilates a very considerable amount of the history of the specialty as he proceeds. The only living Briton who receives recognition is Professor H. L. Sheehan (Sheehan's syndrome); of those who are no longer with us one would have liked to have seen Victor Bonney similarly acknowledged.

One of the lasting impressions which remain from this book is the early age at which most of the subjects made the discoveries for which their names are still remembered. Another is the inconsistency of eponymous fame. Sometimes it is the man who wrote the first description who has been thus recognized (Wolffian body); often a later worker, perhaps unknowing of earlier accounts, has gone down in history (Nabothian cysts); occasionally an earlier and a later writer have eventually been given equal credit (Lee-Falkenhäuser plexus).

Dr. Speert's book is sure to find its way into every medical library, and on to the bookshelf of every one of us who takes other than the narrowest view of his work. It is even likely to be warmly welcomed in Manchester although the author's account of the Manchester operation opens as follows: "Manchester lies at the hub of one of England's major industrial districts, whose chimneys belch forth their acrid smoke in large volume and without pause, polluting the atmosphere with bronchial irritants. Cough is endemic to the area. The wheels of Manchester's industry are turned in large part by women long inured to physical labour. This environment has continued to yield, year in and year out, a gynecologic clientele plethoric with cases of uterine prolapse." Perhaps that city's gynaecologists, if not its Chamber of Commerce, will invite Dr. Speert to visit them before a further edition of this book is printed!

S. Bender

"Iron in Clinical Medicine." Edited by R. O. WALLERSTEIN and S. R. METTIER. Pp. xiii+283, illustrated. University of California Press, Berkeley and Los Angeles, California; Cambridge University Press, London, England, 1958. Price 45*s*.

THIS handsomely produced small volume contains the papers and discussion presented at a symposium on Iron in Clinical Medicine at the University of California School of Medicine, San Francisco, in January, 1957. There are 31 contributors in all, and the 23 articles cover a wide range of modern views on the biochemistry and physiology of iron metabolism, together with the pathology, pharmacology and clinical implications of its disturbances. A very readable and illuminating guide to this important field is provided.

J. B. de C. M. Saunders admirably reviews the historical development of appreciation of the importance of iron in medicine, and in the following chapters, C. V. Moore, C.-B. Laurell, L. Heilmeyer and M. Pollycove clearly present current views on the absorption, transport and utilization of iron, and the methods for investigating the dynamic aspects of these processes, which have practical clinical applications as well as providing insight into the nature of the carefully balanced iron economy.

The general medical and haematological aspects of iron-deficiency anaemia and its treatment are well covered, and there are chapters on special aspects such as the role of copper in erythropoiesis, anaemia of rheumatoid arthritis and alterations in iron metabolism accompanying deficiencies of vitamins B_6 and B_{12}, and the problem of haemosiderosis and haemochromatosis.

* (1) A person who claimed to be able to diagnose pregnancy, as well as various ailments, from study of the physical characteristics of the urine. (2) It is named for Gabriele Fallo*ppio*. (3) They were both women. (4) Primary sarcoma of the ovary. (5) Döderlein. (6) and (7) Fritz Brenner. (8) Naegele's rule, Naegele's asynclitism, Naegele pelvis. (9) Denmark. (10) Boerhaave (1668–1738), who originally laid down "Naegele's rule".

The obstetrician and paediatrician will find some very stimulating contributions on the foetal demand for iron and the iron requirements in pregnancy, and in premature and normal infants and children. There is considerable discussion on the proper role of oral and parenteral iron therapy, the use of transfusions in obstetrics, and the need to employ rational therapy that will result in iron being utilized for haemoglobin formation and not simply inflating the stores of haemosiderin.

The book concludes with a short general Discussion which contains much wisdom and experience, and workers in a number of fields of medicine will find the volume valuable throughout. The printing, binding and general format of the book are good, and illustrations, tables and graphs are plentiful, though in consequence the price is fairly high.

J. C. White

"British Obstetric and Gynaecological Practice." Edited by SIR EARDLEY HOLLAND and ALECK BOURNE.

Gynaecology—Aleck Bourne. Second edition. Pp. xii+891, illustrated, including 8 coloured plates. William Heinemann, Ltd., London, 1958. Price 105*s*.

WE congratulate publishers and editor on the appearance of a new edition of this book after only three years. It is a remarkable achievement having regard to the size of the volume. It belies the gloomy forecast to which we gave expression in our review of the first edition when we referred to the well-known fact that the large textbook is apt to suffer from too long an interval between successive editions—a serious consideration in these days of rapid change. We note that throughout there has been effective revision and the making good of some gaps to which we referred in our previous review. For example, we note the new Sections on Lymphogranuloma Venereum, Granuloma Inguinale and Behçet's Syndrome. In the revision it is satisfying to find that the lists of references to the literature at the end of the chapters have not been forgotten. It is too often the case that, in successive editions of a textbook, the references become increasingly antiquated and less and less relevant.

The illustrations throughout are excellent. In some Sections, as in that devoted to Carcinoma of the Cervix, they are outstanding. The volume is a credit to British Gynaecology and to British medical publishing.

Obstetrics—Sir Eardley Holland. Second edition. Pp. xiv+1228, illustrated. William Heinemann, Ltd., London, 1959. Price 147*s*.

THE appearance within four years of the second edition of this larger volume on Obstetrics is an even greater triumph for editor and publishers. A complete revision of the text has been carried out and the extent of this revision is revealed by the many references to the recent literature that appear at the end of the various chapters. The section on the Physiology of Pregnancy has been replaced by two excellent new chapters on the Function of the Placenta and on Birth—Adaptation from Intra-uterine to Extra-uterine Life. There is a new and useful chapter by the editor on the Evolution of British Obstetrics with special reference to the great changes in administration that have taken place during this century. In our review of the first edition we referred to the high standard of the illustrations. Not satisfied the publishers and editor have carried out a wholesale replacement of the X-ray plates of the last edition by new and improved plates.

"Lehrbuch der Geburtshilfe." By PROFESSOR H. MARTIUS in collaboration with PROFESSOR H. HARTL, and with drawings by K. DROYSEN. Fourth revised edition. Pp. xxiv+731, with 768 illustrations. Georg Thieme Verlag, Stuttgart, 1959. Price D.M.59.70.

THE popularity of this textbook of obstetrics on the continent can be measured by the fact that this is the fourth edition to appear since it was first published in 1948, and in addition an Italian translation is available and a Spanish edition is in preparation. The style has been altered and the text rewritten in order to increase clarity and simplify the presentation of the subject. The author states in the preface to the fourth edition, that he has endeavoured to meet the needs of obstetricians in practice by including the details of the latest therapeutic and technical advances, but at the same time he hoped to provide the student with a short and precise summary of the theory of obstetrics.

The plan of the book is conventional. The first chapter devoted to pregnancy has sections dealing with the normal anatomy and physiology, the diagnosis of pregnancy, and abnormal pregnancy (this includes abortions and ectopic pregnancies, but it is a little strange to find a discussion of premature labour and postmaturity sandwiched between these two subjects). This chapter is concluded by an account of the diseases peculiar to pregnancy and other associated medical conditions. It is in the second chapter that Professor Martius excels himself. He describes simply and succinctly the anatomy, physiology and mechanisms of normal and abnormal labour and discusses their management. The whole book and particularly this chapter is brilliantly illustrated by Miss Droysen. A criticism levelled at the author's companion volume *Lehrbuch der Gynäkologie* applies here also: it would seem preferable to record the appearances of patients and specimens and histological findings by photographs rather than by artistic impressions. The book ends with chapters on multiple pregnancy, the puerperium, lactation, and the physiology and pathology of the newborn. The text is enhanced by instructive and interesting biographical and etymological footnotes.

The value of this work to an English reader lies in the

descriptions and illustrations of the mechanisms of normal and abnormal labour. These are unsurpassed. The remainder of the subject matter is often controversial and particularly the treatments recommended. For instance, internal podalic version and scalp traction are discussed and recommended in the management of placenta praevia in domiciliary obstetrics. The amount of space allotted to certain subjects seems unbalanced on occasions. There are detailed descriptions of external pelvimetry and gross pelvic deformities, whereas uterine inertia is almost glossed over and the toxaemias of pregnancy receive only 11 pages of the text. The descriptions of technical procedures are omitted as Professor Martius has written a separate book on operative obstetrics. The production of the book is of a particularly high standard.

"Die Laparoskopie und die Culdoskopie in der Gynäkologie. (Laparoscopy and Culdoscopy in Gynaecology.)" By H. FRANGENHEIM. Pp. viii+70, with 98 illustrations. Georg Thieme Verlag, Stuttgart, 1959. Price D.M.19.80.

THIS little book provides a concise account of the history and the development of the uses of endoscopy as applied to gynaecology. It is supplemented by an extensive bibliography. The techniques used are described clearly and in detail. The indications, contra-indications and limitations of peritoneoscopy and culdoscopy are discussed in the light of the author's experience of 500 cases. He is careful to point out that these diagnostic procedures can only be of value if used in properly selected cases and under ideal circumstances. Endoscopic examination of the pelvic organs does not replace other diagnostic measures, but it can be invaluable in those cases in which laparotomy alone could otherwise provide the answer. The monograph is completed by an impressive and beautiful series of coloured pictures taken through the peritoneoscope and culdoscope.

This book is valuable for its illustrations alone. It provides a lucid and simple introduction to a diagnostic procedure, which many American and Continental gynaecologists have found to be of value. If an English edition were available, it might well be that the culdoscope would become a much more familiar instrument in the gynaecologist's armamentarium in this country.

"Hermaphroditism, Genital Anomalies and Related Endocrine Disorders." By HOWARD W. JONES and WILLIAM WALLACE SCOTT. Pp. xvi+456, with 466 illustrations. Baillière, Tindall & Cox, Ltd., London, 1958. Price 128*s*.

DR. JONES, a gynaecologist, and Dr. Scott, a urologist, have led a team of five from the Johns Hopkins University in writing a book which is a lineal descendent of Young's classic monograph of 1937 on hermaphroditism and a worthy successor to it. The sixth contributor is Professor Alfred Jost of Paris, who is responsible for an authoritative chapter on embryonic sexual differentiation, and the ingenious experiments of embryologists described therein will elicit the reader's admiration. The first section of the book ends with a short but argued chapter on principles of treatment.

The following sections on hermaphroditism comprise the main bulk of the book. Hermaphrodites are divided into 6 groups, following the classification of Wilkins, and the descriptions of the groups and subgroups are accompanied by full accounts of illustrative cases. The longest chapter is that devoted to female intersexuality due to congenital adrenal hyperplasia; a further section deals with other adrenal disorders affecting sex. Diagnostic methods and surgical therapeutic techniques are fully detailed. From these the authors pass on to discuss genital anomalies which simulate hermaphroditism, notably cryptorchidism, hypospadias and congenital absence of the vagina. Finally, masculinizing tumours of the ovary and endocrine tumours of the testis are considered.

No air of omniscience is allowed to pervade the text, and if there is an occasional over-simplification it is freely admitted at the onset that many aspects still await clarification and many problems remain unsolved. But one is impressed by the number of different types of workers who have contributed to advances in knowledge —biochemists, cytologists, embryologists, endocrinologists, gynaecologists, paediatricians, pathologists, physicians, plastic surgeons and urologists.

Except for a rather carefree use of commas and an occasional mis-spelling (e.g., "fawn" for "faun"), the text makes easy reading. Writing this book has obviously been a labour of love for the authors. Their enthusiasm must have spread to the publishers, and all are congratulated on the elegant production of a profusely and brilliantly illustrated work which is a pleasure to handle.

REVIEW OF CURRENT LITERATURE

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PREGNANCY

138. Evaluation of Certain Pregnancy Tests.

By M. R. K. MENON and P. ISAIAH. *J. Obstet. Gynaec. India*, **9**, 97–107. Dec. 1958. 23 refs.

An attempt is made to estimate the relative efficiency of three pregnancy tests, namely a biological test on the male frog *Rana tigrina* or *Rana hexadactyla*, the histological examination of the vaginal smear, and Roland's test for the arborization of cervical mucus.

One thousand, one hundred and eighty-three frog tests were done. The patient's urine was concentrated and injected into the male frog, and this caused the release of spermatozoa in the cloacal fluid within 4 hours. Accuracy was 100 per cent in the first trimester, 91 per cent in the second, and 95 per cent in the third trimester. There was no variation in accuracy according to the season, as the climate of Madras is equable. When the temperature of frogs was artificially reduced by refrigeration, however, no spermatozoa were produced, and the test could not be carried out.

Roland's mucus arborization test was done in 62 cases, and a correct diagnosis was made in 60 cases, the accuracy being 100 per cent in the first trimester, when a diagnostic aid is most needed. An examination of 395 vaginal smears was made, but the overall accuracy in diagnosis was only 87 per cent, due perhaps to the cytologist. It was thought that the male frog test, using urine concentrate, was the most rapid as well as the most accurate test for pregnancy. *John McKiddie*

139. Pregnancy in the "Young" and the "Old".

By P. H. ARNOT and D. R. NELSON. *West. J. Surg. Obstet. Gynec.*, **66**, 332–339. Nov.–Dec. 1958. 1 ref.

The results are presented for 405 "elderly" primiparae, 218 multiparae over the age of 40 and 33 primiparae under the age of 18. It is found that toxaemia is more common in the elderly primiparae and the young patients, the elderly being also more likely to develop cardiovascular renal disease. The foetal mortality rises with the maternal age and parity, abnormal infants being also more common in the higher age groups. The incidence of Caesarean section is increased in all groups; prolonged labour being common in the elderly and very rapid labour in the young patients. Complications such as fibroids, diabetes, syphilis, etc., are frequent in the older patients but accidental haemorrhage occurs in all groups and is relatively more common in the young patients.

[There is no definition of the "elderly" primipara and this makes the interpretation of the results somewhat difficult.] *D. C. A. Bevis*

140. Investigation of Uterine Blood-flow Using Radio-Active Sodium. (Untersuchungen über die Durchblutung der Gebärmutter mit Hilfe von Natrium 24.)

By L. BECK. *Geburtsh. u. Frauenheilk.*, **19**, 54–63. Jan. 1959. 1 table. 3 figs. 16 refs.

The author has studied the rate of blood flow through the pregnant uterus by means of radioactive sodium

(Na^{24}). A solution containing 10 micro-Curies of the isotope was injected into the myometrium and the rate of fall of radioactivity at the site of injection was measured. The rate of uterine blood-flow was compared in different cases by determining the time interval between injection and the reduction of radioactivity to half the initial value of that of the solution injected.

In 5 healthy women at term (2 were in labour) the time taken for the radioactivity to be reduced to half its initial value was between 5½ and 7 minutes. In 3 cases of prolonged labour in primigravidae the uterine clearance rates were decreased (8½, 11½ and 14½ minutes). In 1 case of mild toxaemia (B.P. 140/90) the uterine clearance rate was 8½ minutes and in 2 cases of severe toxaemia (with blood pressures of 160/100 and 170/110 and both with albuminuria) values of 13 and 18½ minutes were obtained. A patient with albuminuria and a blood pressure of 180/110 was treated for two weeks with protoveratrine and reserpine and she was then found to have a uterine clearance rate for radioactive sodium of 3½ minutes. Normal values were obtained for the clearance of labelled sodium from 2 patients under peridural analgesia and from 2 under spinal analgesia.

In 4 cases radioactive sodium was injected intravenously and the placental blood volume measured. No reduction in placental volume was found in 2 patients under peridural block. But a reduction of 5–8 per cent in the placental blood volume was found in 2 patients after giving a spinal anaesthetic.

[These results are almost identical with those obtained by Professors J. C. McClure Browne, N. Morris and other workers in this country.] *Peter J. Huntingford*

141. **Protein Permeability of the Amnion.** (Scambi proteici transamniotici nella gravidanza normale a termine e nel polidramnios.)

By G. B. CANDIANI. *Minerva ginec., Torino,* **19,** 747–748. Oct. 15, 1958. 2 tables. 3 figs. 6 refs.

This is a short note continuing the study of the permeability of the human amnion to protein molecules at term. Protein labelled with radio-iodine 131 was given intravenously to healthy pregnant women at term and appeared in the liquor amnii in 6 hours, reaching maximum concentration in 12 hours. In a case of polyhydramnios it appeared in the liquor in 3 hours and concentration was still rising at 18 hours. Given into the amniotic sac, it appeared on the maternal side in 12 hours. *W. C. Spackman*

142. **Histological and Histochemical Studies of the Normal Human Amniotic Epithelium.** (Indagini istologiche ed istochimiche sull'epitelio amniotico umano normale.)

By G. NICORA, C. NONNIA MARCANO and C. M. SIRTORI. *Ann. Ostet. Ginec.,* **80,** 107. Feb. 1958. 30 figs. 41 refs.

This study of human amniotic epithelium is divided into two parts. The first part describes the histological appearances during the progress of pregnancy. The use of the phase-contrast microscope is recommended.

The second part consists of histochemical studies which show that secretion by the amniotic epithelium is important. Typical curves are given for different substances; the levels of glyco-proteins are highest from the second to the fourth month. Proteins are highest during the fifth and sixth months, while fats reach their maximum levels during the last three months of pregnancy.

The amniotic fluid is probably of limited importance in the nutrition of the foetus as far as carbohydrates and proteins are concerned; these are supplied mainly through the placental circulation. The amniotic epithelium, is, however, important in the production of fats and plays a major part in the production of vernix caseosa. *Josephine Barnes*

143. **The Gravimetric Estimation of Chorionic Gonadotropin in Normal and Pathologic Pregnancy.**

By C. A. JOEL and M. LANCET. *Obstet. Gynec.,* **13,** 51–60. Jan. 1959. 1 table. 13 figs. 20 refs.

In the gravimetric method of estimating chorionic gonadotrophin in the urine of pregnant women, 0·4 ml. of urine is injected into 5 juvenile mice about 30 days old 4 times a day for 2 days, while on the third day 2 injections are given. The mice are killed after 72 hours, and ovaries and uteri are weighed separately. These weights are used as a measure of the chorionic gonadotrophin excretion in the patient's urine.

As a pregnancy test, it has been found to be both accurate and useful, and the ovarian weights show a close correlation with other more tedious and expensive methods of estimating chorionic gonadotrophin.

Disturbances in the pregnancy which lower the chorionic gonadotrophin excretion immediately show up as a decrease of mouse ovarian and an increase of mouse uterine weights. Repeated tests in the same patient give an accuracy in prognosis of 75 per cent. As a test for hydatidiform mole or chorionepithelioma, this method is as useful as the Aschheim-Zondek reaction.

In amenorrhoea due to ovarian deficiency, ovarian weights are low and uterine high, whilst in that due to pituitary hypofunction neither organ shows any weight increase. In menopausal amenorrhoea, an increase in uterine weights is seen. *J. G. Dumoulin*

144. **Progestogens.** (Gestagene im menschlichen Organismus.)

By J. ZANDER. *Bull. Soc. roy. belg. Gynéc. Obstét.,* **28,** 423–437. 1958. 6 figs. 82 refs.

The author discusses progestogens. Besides progesterone the body elaborates Δ^1-3-ketopregnene-20α-ol and Δ^4-3-ketopregnene-20β-ol. Both hormones are biologically potent metabolites of progesterone. The Graafian follicle elaborates progestogens for about two

days prior to ovulation, and in the corpus luteum phase a peak is found between the 7th and 8th day following ovulation. During the second month of pregnancy the output of progestogens by the placenta is relatively high and it increases further during the course of gestation. During the first month of pregnancy the hormone content of the placenta has already increased. Progesterone has been estimated in peripheral blood and in the vessels leaving the placenta. The data allow the amount of progesterone secreted by the placenta at the end of gestation to the estimated. Progesterone disappears from the blood stream in a few minutes. Absorption in tissues (adipose tissue) and chemical breakdown (liver, kidney and peripheral tissues) are responsible for this.

The author discusses the role played by progesterone in the biosynthesis of sex hormones. Recent data favour the following chain reaction: acetate→cholesterol→progesterone→androgens→oestrogens. In case of increased production of androgens by the ovary biosynthesis may be altered, as is suggested in cases of arrhenoblastoma.

Author's Summary

145. **Aldosterone Excretion in Pregnancy.** (Osservazioni preliminari sulla concentrazione di aldosterone nell'urina di donna gravida.)

By P. Mutti and N. Ragucci. *Minerva ginec., Torino*, **19**, 748–755. Oct. 15, 1958. 1 table. 1 fig. 46 refs.

Aldosterone is a hormone secreted by the glomerular zone of the adrenal. It regulates the water-saline exchanges and balance. The total activity of the gland rises in pregnancy but the cortex increases in volume at the expense of the glomerular and fasciolate zones. Especially in the third trimester of pregnancy there is a marked tendency towards retention of salt which in turn causes water retention in the tissues and resulting oedema.

The excretion of aldosterone can be determined by urine analysis but not its total production because the amount used up in the total metabolism is not known. The urinary excretion of aldosterone was found to rise moderately in the early months and to rise sharply in the third trimester to five times its former value. In two cases of eclampsia extremely low values were found by comparison.

W. C. Spackman

146. **A Phase of the Autonomic Nervous System in Obstetrics and Gynecology.**

By E. H. Abou-Shabanah, J. C. Ullery and J. B. Winger. *Surg. Gynec. Obstet.*, **107**, 744–748. Dec. 1958. 1 fig. 9 refs.

In this investigation of uterine innervation from Columbus, Ohio, 3 groups each consisting of 10 pregnant dogs were employed.

In the first group sympathectomy was performed by removal of 1 inch of the hypogastric nerve in its abdominal course. In all of the dogs pregnancy continued without interruption.

In addition to sympathectomy, parasympathectomy was performed in the second group by division of the 3 anterior sacral roots of the pelvic nerve. In all cases expulsion of the uterine contents took place within 12 to 36 hours following the operation.

Dogs in the third group were subjected to parasympathectomy alone. Those in early pregnancy (up to the end of the 4th week) lost their foetuses which were absorbed. In the remainder, pregnancy continued to postmaturity and labour was prolonged. In each case the first puppy was born spontaneously but most of the remaining puppies required manual assistance before they were delivered. Failure to give this aid, more often than not, resulted in stillbirth. All of the puppies showed signs of postmaturity. Shortly following parasympathectomy all of the dogs in this group developed vulval hypertrophy which remained for 4 weeks and longer in the puerperium.

From these findings the authors conclude that both the sympathetic and parasympathetic nerves exercise control over uterine activity. They believe that sympathectomy is followed by relaxation of the uterine muscle and that this relaxation plays a big part in the relief of dysmenorrhoea in humans following pre-sacral neurectomy.

The findings in the third group of dogs provide evidence that the parasympathetic nerve is the motor nerve to the uterus. It also appears to control oestrogenic activity, as following its division signs of oestrogenic hyperactivity appeared in the form of vulval enlargement and none of the dogs in this group lactated following delivery.

John P. Erskine

147. **The Action of Chlorpromazine on Isolated Uterine Muscle.** (Azione della clorpromazina sul muscolo uterino isolato.)

By C. Orlandi and F. Bottiglioni. *Ann. Ostet. Ginec.*, **80**, 169. Feb. 1958. 9 figs. 32 refs.

This is a carefully illustrated study of the effect of chlorpromazine on the isolated uterus, using the rat and the guinea-pig as experimental animals.

On the virgin or recently pregnant uterus chlorpromazine exerts an acetylcholine-like action in stimulating uterine contraction. This stimulation is followed by marked inhibition of uterine activity.

At the end of pregnancy only inhibition of uterine contractions is seen, and this effect has been observed to last about four hours.

The obstetrical implications of these findings are discussed.

Josephine Barnes

148. **X-rays and Pregnancy.** (Rayos X y embarazo.)

By V. Cónill, Snr. *Obstet. Ginec. lat-amer.*, **16**, 36–42. Feb. 1958. 28 refs.

Reviewing his experience in radiology since he took up the speciality in 1913, the author states that he knows of at least three women to whom he gave deep X-ray therapy

in early pregnancy, being unaware of their condition, and it is upon these cases that he writes his report.

The first case was suffering from metropathia haemorrhagica; she had been married for 23 years, but no conception had ever occurred. After exposure to deep X-ray therapy, pregnancy was discovered. This proceeded to term and a normal child was born. Three further pregnancies followed in rapid succession; all the children have grown up normally, the youngest being now aged 30 years.

In the second case irradiated, the patient was delivered of a mongol, and the third patient gave birth to a baby suffering from xerophthalmia.

The author then enumerates the references on this subject and states that of 229 such cases reported, in 53 the foetus was affected. He therefore suggests that in cases where X-ray therapy has been given to the pelvis of a pregnant woman, termination of the pregnancy should be seriously considered, otherwise the foetus appears to run a risk of developing leukaemia or malignancy early in life.

The use of irradiation for terminating pregnancy in cases of phthisis is discussed, and the author states that subsequent examination of the foetuses treated in this way has shown that it is the nervous system which undergoes the most marked abnormal changes. After discussing experiments carried out on pregnant rats, the author concludes the report by stating that because X-rays can do damage to a foetus at any age they should only be used when no other means will provide the data required.

John F. Foulkes

149. **Influence of Chlorothiazide on Water and Electrolyte Excretion in Pre-eclampsia.**

By R. R. De Alvarez and J. M. O'Lane. *J. Amer. med. Ass.*, **168**, 2226–2234. Dec. 27, 1958. 9 figs. 13 refs.

Chlorothiazide has shown considerable promise as an oral diuretic and the authors have studied the mechanism of diuresis involved in toxaemia of pregnancy with special reference to possible electrolyte imbalance. From the University of Washington School of Medicine and Hospitals they studied 14 women admitted for toxaemia of pregnancy. In addition to the usual treatment they were given 500 mg. of chlorothiazide orally twice a day and the results compared with a group of 23 patients who received the same treatment but without chlorothiazide.

Chlorothiazide *in vitro* strongly inhibits carbonic anhydrase but its action in toxaemia differs from that of other carbonic anhydrase inhibiting diuretics, and also from that of mercurial diuretics. Full biochemical data are tabulated in detail, and the chief conclusions are that chlorothiazide is a potent agent in promoting urinary excretion of sodium, potassium, and chloride from the body. There were no consistent changes in urinary pH, titratable acidity, mean urinary ammonia level, or serum electrolytes. No instances of toxicity or undesirable side effects were noted.

[The chief interest in the report of this small series of cases lies in the very full account of the biochemical changes following the administration of chlorothiazide.]

D. W. James

150. **The Use of Controlled Hypothermia in the Treatment of Eclampsia.** (Die Anwendung der kontrollierten Hypothermie bei der Behandlung der Eklampsie.)

By G. Seidenschnur. *Zbl. Gynäk.*, **81**, 16–19. Jan. 3, 1959. 1 fig.

The author reports a case of eclampsia in a primigravida of 19, treated initially with a "lytic cocktail" after 2 convulsions. This failed to prevent 4 further convulsions. Ten hours after treatment had been started, the patient developed pyrexia and signs of circulatory failure began to appear. Twenty-four hours after admission the body temperature reached 104° F. There was massive vomiting of black fluid, requiring continuous endotracheal and gastric suction. The peripheral pulse was no longer palpable, the heart rate was 140. The patient was dyspnoeic and cyanosed. At 36 hours the temperature rose to 106° F., the heart rate to 200, respiration consisted of shallow gasps. The foetus was dead.

As a last resort, treatment with controlled hypothermia was decided upon. The patient was covered with small pieces of ice. With the cooling of the body the circulatory condition improved, the heart rate dropped to 60–80 beats per minute, and the systolic blood pressure became recordable at 80 mm. Hg. The most impressive observation was the disappearance of cyanosis and dyspnoea. After an initial reduction to 93·2° F., the body temperature was maintained at 98·6° F. Twenty-four hours later the membranes ruptured, and strong uterine contractions followed. Delivery was completed with forceps. From the next day the patient made a steady recovery.

The author suggests that controlled hypothermia should be used in otherwise hopeless cases of eclampsia.

Bruce Eton

151. **The Use of Largactil in Vomiting of Pregnancy, Threatened Abortion, Ante-partum Haemorrhage, and Premature Labour.** (Wplyw Largaktylu na wymioty ciezarnych, zagrazajace poronienie oraz krwawienia i przedwczesne skurcze macicy w drugie.)

By M. Glowinski and G. Sieron. *Ginek. Polska*, **29**, 647–658. 1958. 3 tables. 1 fig. 20 refs.

The authors used Largactil (chlorpromazine) in a series of non-selected cases of vomiting in pregnancy, threatened abortion, ante-partum haemorrhage, and premature labour. They came to the following conclusions:

In 14 cases of vomiting of pregnancy Largactil was definitely a great help. The treatment should start by intravenous drip, and be continued by the intramuscular route, and finally Largactil can be given orally. The treatment should continue for a while after the cessation of vomiting.

In 24 cases of threatened abortion, Largactil was used, also with great benefit. However, the authors point out that treatment should not be confined to Largactil alone, and all other remedies for threatened abortion should be used.

Largactil was also used in 15 cases of haemorrhage and premature labour. It diminished the bleeding, and stopped the uterine contractions, so that pregnancy could be prolonged, and in some cases carried to term. They treated 50 cases in all with Largactil, and found no side effects to the mother or child.

S. H. Riterband

152. **Placenta Accreta and Its Treatment.** (Placenta accreta: ein Beitrag zu ihrer Behandlung.)

By J. KOUTSKY. *Gynaecologia, Basel,* **146,** 399–406. Nov. 1958. 7 refs.

Placenta accreta may be complete, partial or focal. The author describes 2 complete cases occurring out of 12,870 deliveries at the University Hospital, Prague, and reviews the literature. The cause may be traumatic, inflammatory or due to an endocrine disturbance of the endometrium. It is more likely when the placenta is inserted near the cervix or in one horn of a bicornuate uterus, and is sometimes associated with fibroids. If it is complete there is no bleeding in the third stage. There is sometimes a history of abdominal pain during the latter weeks of pregnancy or excessive pain in the first stage of labour.

The best treatment is blood transfusion and hysterectomy, either total or subtotal, but the condition is difficult to recognize without a preliminary attempt at manual removal. Conserving the uterus even at Caesarean section is seldom justified because of a recorded mortality of 60 per cent. Complications of placenta accreta include ruptured uterus, inversion and necrosis with puerperal peritonitis.

Both cases described were multiparae with a history of uterine curettage for a previous incomplete abortion. The first patient presented with a ruptured uterus at the seventh month of pregnancy, the second was found to have a ruptured uterus at laparotomy because of bleeding with peritonitis following an unsatisfactory curettage for a 16-week incomplete abortion. In both the rupture occurred at the placental site and it was shown histologically that the chorionic villi had completely penetrated the uterine wall.

Jean Hallum

153. **Accidental Haemorrhage Treated by Caesarean Section.**

By F. A. L. DA CUNHA. *Brit. med. J.*, **1,** 551–552. Feb. 28, 1959. 9 refs.

A series of 92 cases of accidental (retroplacental) haemorrhage occurring at Oldham (1953–57) and Ashton-under-Lyne (1953–56) General Hospitals, is surveyed.

There were no maternal deaths but 55 (59 per cent) of the babies were lost (52 stillbirths and 3 neonatal deaths). In 36 of the cases (39 per cent) frank retroplacental haemorrhage caused intra-uterine death of the foetus before admission to hospital. In 25 cases (27 per cent) foetal distress occurred in labour but retroplacental haemorrhage was evident only after delivery. In the remaining 31 cases (34 per cent) frank retroplacental haemorrhage had occurred but foetal heart sounds were present at the time of admission to hospital. Sixteen of these cases were delivered by Caesarean section with a foetal mortality of 31 per cent, and 15 were delivered *per vaginam* following artificial rupture of the membranes, with a foetal mortality of 87 per cent.

These results prompt the author to advocate Caesarean section as the best method of delivery for cases of frank retroplacental haemorrhage when the foetal heart sounds can still be heard on admission to hospital.

In approximately half the cases in this series, there was no evidence of hypertension or pre-eclampsia, and placental separation occurred without any warning.

R. W. Grayburn

154. **Control of Threatened Abortion by Means of a Urocytogram.** (Control de la amenaza de aborto con el urocytograma.)

By G. DI PAOLA and I. USUBIAGA. *Obstet. Ginec. lat.-amer.*, **16,** 85–89. Apr. 1958. 4 figs. 10 refs.

The authors begin by criticizing the clinical management of threatened abortions, the inaccuracy of the Mainini test and the uncertainty of ovular death; in such cases, the obstetrician does not know whether hormonal therapy is indicated. It is claimed that accurate information can be obtained to guide the clinician by histological examination of the cells found in the urine after centrifuging it, then drying and staining the deposit. In normal pregnancy, the cells found in the urine are predominantly basophils; acidophils only amount to 5 per cent during the first two months, and less still (0·6 per cent) by the end of the gestation. An increase of the acidophil percentage indicates hormonal deficiency, and a large rise, especially if stilboestrol has been given to the patient, is diagnostic of ovular death.

A series of 90 pregnant women is reported, whose urine was routinely examined for cells and their ratio, twice weekly. Thirty-nine had uneventful gestations; 51 threatened to abort, and 15 of these showed a normal acidophil curve indicating a non-hormonal aetiological factor. The remaining 36 showed the acidophil elevation indicative of hormonal deficiency, and of 29 of these who were promptly given hormone therapy, 17 successfully continued the pregnancy. Of the other 7 cases, 2 were found to be ectopic pregnancies, and 5 received no hormone therapy, yet among them 4 continued the gestation uneventfully.

John F. Foulkes

155. **Defibrination Syndrome in Pregnancy.**

By A. A. SHARP, B. HOWIE and R. BIGGS. *Lancet,* **2,** 1309–1313. Dec. 20, 1958. 3 tables. 29 refs.

The condition of "obstetric shock" in late pregnancy

is usually associated with accidental retroplacental haemorrhage, the retention of a dead foetus, or the presence of amniotic-fluid emboli in the lungs. In some instances there is complete breakdown of the normal haemostatic process and this is characterized by apparent loss of blood-fibrinogen and requires prompt treatment. A wide variety of laboratory diagnostic tests have been used and the authors present their findings in four cases of obstetric defibrination. Whole blood clotting-time was found to be useful in assessing the clotting defect, but the thrombin titre test proved to be the most reliable and sensitive indicator of the defect. Thrombin-time was found to be longer in these cases but a less sensitive indicator of minor fluctuations in the severity of the syndrome. The one-stage prothrombin time, and the rapid estimation of fibrinogen by ammonium sulphate precipitation and by the biochemical method were not considered suitable for the diagnosis of the syndrome. All four cases described had thrombocytopenia. It has been suggested that the decidua or placenta liberates tissue thromboplastins which produce intravascular clotting and thus cause defibrination when they gain access to the maternal tissues. It has also been suggested that a tissue-fibrinokinase, liberated from the damaged tissue, activates the fibrinolytic system, which in turn destroys the circulating fibrinogen.

The authors are of the opinion that the low levels of antihaemophilic globulin and factor V and the diminished number of circulating platelets support the concept that the defect in these cases is the result of an episode or episodes of intravascular clotting; and also that the defect in the early stages of the syndrome may consist of a qualitative alteration in the reactivity of fibrinogen to thrombin rather than a single quantitative depletion of fibrinogen.

H. H. Fouracre Barns

156. **Megaloblastic Anaemia of Pregnancy and the Puerperium.**

By C. GILES and E. M. SHUTTLEWORTH. *Lancet*, **2**, 1341–1347. Dec. 27, 1958. 9 figs. 3 tables. 37 refs.

An investigation was started because several pregnant women who failed to respond to iron therapy were found to have a megaloblastic marrow. In the present series of cases patients with a haemoglobin level at or below 65 per cent were investigated. If after oral, or more rarely parenteral, iron treatment for 3–6 weeks there was no improvement in the haemoglobin level, then sternal puncture and other investigations were carried out. If a megaloblastic marrow was revealed, then folic acid was given in doses of 30 mg. a day by mouth. Seventeen patients needed blood transfusion. More than half the patients were followed up after delivery as out-patients for up to six months. Four hundred and seventy-four patients came under review, of whom 347 were late bookings, emergency admissions or patients in the puerperium. In 90 the marrow was found to be megaloblastic, in 372 it was normoblastic and in a further 12 megaloblastic anaemia was suspected but a firm diagnosis could not be established. Seven patients with megaloblastic anaemia were admitted with puerperal anaemia after delivery at home, the remaining 83 patients were delivered in hospital. The incidence of megaloblastic anaemia of pregnancy in this series was 1 in 39 hospital confinements (2·8 per cent). Sternal puncture proved to be the more rapid and certain method of diagnosis as compared with direct blood examination. The lowest haemoglobin level encountered was 12 per cent, and it was found that severe anaemia in late pregnancy or the puerperium was much more likely to be megaloblastic than due to iron deficiency. The peak reticulocyte response to folic acid occurred within 5 to 10 days and was of the order of 10–20 per cent. The serum-iron was raised in 63·5 per cent of the cases. The serum-iron level fell within 48–72 hours of starting folic acid treatment. Thirty-seven per cent of cases had achlorhydria, but there is no record in the present series of a relapse following folic acid therapy. In only 4 patients was the faecal fat excretion thought to be greater than normal, and it was therefore considered that folic acid deficiency due to malabsorption of fat was not a common cause of megaloblastic anaemia of pregnancy. The authors' investigations did not lead them to conclude that there was a seasonal prevalence for the condition, but there was a prevalence of megaloblastic anaemia in the higher age groups, the mean age in the series being 28·9 years. Eighty per cent of all cases of megaloblastic anaemia were in multiparae with a high incidence of the disease during the third and fourth pregnancies. The onset of the disease was insidious and it was therefore difficult to determine the time when the anaemia first appeared. Glossitis and ulceration of the mouth were noted in 13 cases and splenomegaly was observed on several occasions. Some degree of anorexia was present in 51 per cent of cases. All the cases responded well to folic acid treatment but the response to vitamin B_{12} was poor. The proportion of anaemic women who had an inadequate overall diet during pregnancy was substantially higher than in normal controls. Meat intake varied most between the different groups. Only 35 per cent of patients with megaloblastic anaemia ate 3 or more meat meals a week compared with 80 per cent of patients with normoblastic anaemia and 91 per cent of healthy controls. The importance of meat however is not altogether apparent since folic acid is also contained in many vegetable foods. The authors suggest that folic acid should be given to all cases of anaemia in late pregnancy which do not respond promptly to iron. They conclude that the role of vitamin B_{12}, folic acid and ascorbic acid in the maintenance of normal erythropoiesis and nucleic acid metabolism generally is exceedingly complex, and that until more is known about the exact inter-relationship of all these factors the aetiology of megaloblastic anaemia in pregnancy is unlikely to be fully understood.

H. H. Fouracre Barns

157. **Intravenous Infusions of Iron (with Cobalt) in the Treatment of Severe Iron Deficiency Anaemia During Pregnancy.**

By E. J. SEQUEIRA and M. N. PARIKH. *J. Obstet. Gynaec. India.*, **9**, 121–128. Dec. 1958. 10 refs.

The authors have tried the effect of treatment of iron deficiency anaemia by the administration of intravenous infusion of iron with cobalt. This treatment was employed in patients during the second and third trimester, who were not sufficiently near term to make a blood transfusion the treatment of choice.

After a test dose, treatment consisted of giving 5 ml. of an intravenous iron preparation containing 60 mg. saccharated ferric oxide and 2 mg. cobalt. This was repeated on the following day. On the third day, the patient was given 300 mg. of iron and 10 mg. of cobalt in 500 ml. of 5 per cent glucose solution. This was repeated once after 72 hours, and a second time if necessary after a similar interval. Transfusion was at the rate of 40 drops per minute.

Twenty-three patients were so treated. The average duration of treatment was 12 days, with a daily average rise of haemoglobin of 1·4 per cent. The authors are not prepared to say what improvement, if any, the addition of cobalt made to their therapy. In the absence of any reaction to a test dose, the treatment is considered safe. It is thought that excessive deposition of iron in the tissues may occur without adverse effect, and it is postulated that such iron may ultimately be made available for future haemoglobin formation.

John McKiddie

158. **Stellate Ganglion Block for Pulmonary Embolism Complicating Pregnancy: Report of a Case.**

By H. EBNER. *Obstet. Gynec.*, **13**, 99–102. Jan. 1959. 3 tables. 2 figs. 8 refs.

Pulmonary embolism is one of the commonest causes of maternal death today. Out of 32 cases of pulmonary embolism, 21 died, a mortality of 65 per cent. The author believes that stellate ganglion block may be a life-saving procedure in such cases, and he cites a case in which it was successfully used.

The injection is made by retracting the sterno-mastoid muscle and carotid sheath laterally. The syringe needle is advanced, with the patient lying flat on her back, in a perpendicular and posterior direction until bone is contacted. This is the transverse process of the seventh cervical vertebra. The needle is then withdrawn 0·5 cm. and 10 ml. of 1 per cent Xylocaine is injected. The appearance of Horner's syndrome indicates a successful block. Within 2 minutes, in the author's case, the patient experienced complete relief of pain and her breathing was much easier.

J. G. Dumoulin

159. **Vasomotor Rhinitis of Pregnancy.**

By R. T. BARTON. *West. J. Surg. Obstet. Gynec.*, **66**, 347–348. Nov.–Dec. 1958. 8 refs.

This condition is usually of short duration and so radical measures are not indicated, although septal deviation and nasal polypi may safely be corrected in pregnancy. Allergic stimuli should be avoided but desensitization may precipitate abortion. Rauwolfia compounds tend to make the condition worse and should be combined with antihistamines if they have to be used. During 1956–57 the author treated a number of patients in California. Most of them responded well to oral vasoconstrictors, antihistamines and sedatives but 40 proved resistant to treatment. These 40 were treated with a variety of nasal vasoconstrictors, all of which were fairly effective, possibly the best being Medihaler-Phen (Riker).

D. C. A. Bevis

160. **Diaphragmatic Hernia of the Oesophageal Hiatus in the Puerperium.** (La hernia diafragmatica del hiato esofágico en el estado puerperal.)

By M. L. PÉREZ. *Obstet. Ginec. lat-amer.*, **16**, 326–333. Oct. 1958. 4 figs. 24 refs.

The author reports a case of diaphragmatic hernia at the oesophageal hiatus during pregnancy. In the first gestation the patient developed, during the third trimester, symptoms of heartburn, acid eructations, hiccoughs, etc., which were aggravated by lying down. No relief was obtained from the usual gastric medicaments. After delivery, all the symptoms completely disappeared. In the subsequent pregnancy, however, they all returned at about the same stage as previously; radiological investigation of the stomach revealed the diagnosis.

The literature on the subject is reviewed: 98 per cent of cases occur during pregnancy. The inference is drawn that this condition does not necessitate therapeutic abortion if diagnosed early in pregnancy, but should be treated palliatively by antispasmodics, sedatives, and propping the patient up in the Fowler position for sleep. Delivery by forceps extraction or Caesarean section may be advised in marked cases to avoid pushing in the second stage. Surgical treatment is only required if strangulation occurs.

John F. Foulkes

161. **Incidental Appendectomy in Obstetrics and Gynecology.**

By D. V. POWELL, D. E. HOLMES, D. H. BEATH, G. H. YARD and P. J. NOEL. JR. *Obstet. Gynec.*, **12**, 727–732. Dec. 1958. 3 tables. 26 refs.

The authors argue that incidental appendicectomy in obstetrical and gynaecological surgery is a safe procedure, and should be performed unless the patient's condition makes the added procedure hazardous. It does not increase the incidence of morbidity, intestinal obstruction or hospital stay, even when done with the presence of blood in the peritoneal cavity. It should be done in all types of case including Caesarean section. Hesitation reflects a prejudice and is not based on factual data.

J. G. Dumoulin

162. **Backache of Pregnancy: A Method of Treatment.**

By R. X. SANDS. *Obstet. Gynec.*, **12**, 670–676. Dec. 1958. 6 figs. 8 refs.

As a result of the softening action of the hormone relaxin on the ligaments of the pelvic joints in pregnancy there is increased mobility at these joints. The author believes that the majority of backaches of pregnancy result from the increasing weight of the patient's trunk forcing the wedge-shaped sacrum down between the bones of the sacro-iliac joints. In addition, the alteration of posture due to abdominal enlargement tends to displace the sacrum forward. He describes the mechanism as subluxation.

He described a method of manipulating this joint in pregnancy. With the patient lying on her side, he pushes the shoulder in one direction and the buttock in the other direction, and gives a forceful push to the hip when the shoulder is flat on the bed. The opposite joint is similarly treated.

Fifteen years of experience has shown this to be a good therapeutic measure in backache of pregnancy.

J. G. Dumoulin

163. **Polyhydramnios and Oligohydramnios.**

By T. N. A. Jeffcoate and J. S. Scott. *Canad. med. Ass. J.*, **80**, 77–86. Jan. 1959. 6 figs. 45 refs.

Clinical observations are reviewed which show that provided the other mechanisms for the production and absorption of liquor are operating normally, pathological conditions of the foetus which prevent the foetus from swallowing and absorbing liquor from the intestine result in polyhydramnios, while lesions which are incompatible with micturition cause oligohydramnios.

A review of 169 consecutive cases of polyhydramnios revealed 54 (32 per cent) to have malformations which interfered with swallowing or intestinal absorption. These included anencephaly, iniencephaly, hydrops foetalis, oesophageal and duodenal atresia and diaphragmatic hernia. In the remainder no explanation was found, neither circumvallation of the placenta, mongolism, cardiac malformation nor other pathological entities being found in abnormal proportion as compared to all deliveries in the hospital during the period of survey. It was noted that polyhydramnios associated with foetal ingestion defects rarely appeared before 20 weeks, suggesting that the swallowing mechanism is not the main method of disposal until late in pregnancy, or that there is additional liquor to be removed after mid-pregnancy. Foetal polyuria or an overactive secretory function of the amnion may explain the cases with a normal intestinal tract.

A study by one author (J.S.S.) with A. D. Bain of 50 consecutive cases of renal agenesis and dysplasia revealed evidence of a deficiency of liquor in 28 cases, a specific note of negligible or absent liquor in 7 cases, no note of the presence or absence of liquor in 14 cases, and in only one case a clinical history of liquor being definitely seen, and that in a case of polyhydramnios with the association of iniencephaly. Evidence is given to suggest that the urinary tract is more important than the respiratory system in the normal production of liquor. A diagnostic pathological entity termed "amnion nodosum" is described. The lesion is merely a disorderly mass of keratinized squames loosely embedded on the amnion, appearing grossly as dull, grey-yellow nodules on the foetal surface of the amnion, but more numerous and obvious on the part of the membrane covering the placenta.

Statistics are presented showing the relationship of foetal size to the volume of liquor in the uterus, a correlation existing between the foetus and its placental size, the latter dependent upon the degree of uterine distension maintained by the amniotic fluid.

O. A. Schmidt

164. **Prolapse of the Uterus in Pregnancy.**

By H. J. H. Claassens. *S. Afr. med. J.*, **33**, 175–177. Feb. 28, 1959. 2 figs. 10 refs.

It is stated that only 192 cases have been described, and the incidence is one in 10,000–15,000 pregnancies. Gross hypertrophy of the cervix during pregnancy may be difficult to differentiate from prolapse. Descent can be expected to occur until the 12th week, when the uterus tends to be lifted out of the pelvis, but exceptions to this are frequent. There are many obstetrical complications such as increased risk of abortion, urinary difficulties (with or without infection), premature labour, cervical dystocia, puerperal infection, a high foetal mortality rate and post-partum prolapse. Reviewing Keettel's collected series, methods of delivery were spontaneous 35 per cent, forceps 23 per cent, Dührssen's incisions in 30 per cent, version and extraction in 4 per cent and Porro-Caesarean section in 1 per cent. The foetal mortality was 22 per cent and the maternal mortality was 6·3 per cent. However many of these patients died of puerperal sepsis prior to the antibiotic era. In 22 subsequent cases described there were no maternal deaths and there was one stillbirth.

Regarding treatment, the prolapse should be corrected at an early stage with a pessary for fear of incarceration or abortion. When the onset is acute, bed rest with the foot of the bed raised is suggested. Reduction under anaesthesia may become necessary, and inability to do so may be an indication for therapeutic abortion. Watchful conservatism is the treatment of choice during labour. If spontaneous delivery does not occur, Dührssen's incisions and the use of low forceps should suffice. The use of a pessary after labour is recommended, but it should not be allowed to be trapped by the involuting birth canal. Three cases are described.

L. J. Abramowitz

165. **Uterine Fibromyomata in Pregnancy.** (Fibromyome de l'utérus et grossesse.)

By S. Ihaliotis. *Gynéc. prat.*, **9**, 232–235. 1958. 26 refs.

Between the years 1951 and 1957 there were 143 cases of fibromyomata in 38,277 women delivered in the author's unit.

Spontaneous abortion, mostly at the third month, occurred in 24·5 per cent and premature deliveries in

6·3 per cent of these cases. Premature rupture of the membranes occurred in 34·7 per cent and malpresentation was frequent (shoulder 8·8 per cent, breech 10·3 per cent).

Most fibromyomata caused no complications during pregnancy, but the author resorts to myomectomy quite readily for those that do (25 patients). He considers this is a safe procedure but is prepared to terminate the pregnancy if the uterine cavity is opened or if deep intramural fibroids are found.

He also considers that using the technique he advocates, Caesarean section may safely be followed with myomectomy although he does state that Caesarean hysterectomy is probably a less dangerous procedure.

H. G. Dixon

166. **Chorionepithelioma in Association with Late Pregnancy.** (Chorionepitheliom bei fortgeschrittener Schwangerschaft.)

By H.-J. SIEGELER and G. FRANZ. *Geburtsh. u. Frauenheilk.*, **19**, 70–77. Jan. 1959. 5 figs. 34 refs.

The authors have reviewed the literature concerning the very rare association of chorionepithelioma and late pregnancy and report a further case of their own. A primigravida, aged 29, was admitted at 32 weeks with severe pain in the right hypochondrium and slight jaundice. Her condition rapidly deteriorated and she died 11 days after admission. A chest X-ray revealed multiple metastatic deposits in both lungs. An X-ray of the abdomen showed a normal foetus for the duration of the amenorrhoea. The foetal heart was audible until 24 hours before the patient died. Only a limited autopsy could be performed and a detailed examination of the uterus and its contents was not possible. The peritoneal cavity contained 2 pints of blood. The external surface of the uterus appeared normal. The right adnexa were replaced by a large tumour adherent to the pelvic sidewall, and in the pouch of Douglas to the rectum. The left adnexa were normal. Microscopical examination of tissue removed from the right adnexa, rectum and the liver showed typical deposits of chorionepithelioma. The authors claim that this is only the second case to be recorded of chorionepithelioma associated with an advanced pregnancy occurring in a primigravida.

Peter J. Huntingford

167. **Ectopic Pregnancy in a Tube Infested with Bilharzia.**

By M. G. H. MAYAT. *S. Afr. med. J.*, **33**, 219–220. Mar. 14, 1959. 2 figs. 8 refs.

The author quotes Charlewood (*Bantu Gynaecology*, 1956) as stating that "only 3 cases have been reported of ectopic pregnancy in association with bilharzial salpingitis". A case of an Indian patient with ectopic pregnancy is described. At laparotomy small whitish pinhead tubercles were scattered over both tubes, and these tubercles appeared in the serosal layer. Histological examination revealed calcifying bilharzial ova in the subserous layer of the tube.

The pathology is discussed. *Sch. haematobium* affects the wall of the tube, and rarely the mucosa, whereas *Sch. mansoni* causes destruction of the mucosa. The diagnosis of bilharzial salpingitis and differentiation from other forms of salpingitis is difficult. A history of bathing in infected waters is important and also urinary investigations for ova. Tubes which have tubercules scattered in their serosal surfaces should not be removed. Gelfand reports a case in which a grossly distorted tube was removed. The other tube had scattered tubercules. Two years after a course of antimony the patient became pregnant.

L. J. Abramowitz

LABOUR

168. **Diagnosis of Impending Onset of Labour by Means of an Oxytocin Sensitivity Test.** (Erkennung des bevorstehenden Geburtsbeginnes mittels "Oxytocin-sensitivity-Test".)

By E. GÖLTNER. *Zbl. Gynäk.*, **81**, 113–119. Jan. 24, 1959. 1 table. 7 figs. 19 refs.

The author carried out a trial with the oxytocin sensitivity test (Smyth, *J. Obstet. Gynaec. Brit. Emp.*, 1957, **64**, 59) in 150 women in the latter part of pregnancy. Assessment of the response to oxytocin by abdominal palpation proved to be inconclusive in 50 women, showing no relationship between the dosage required and the interval before the onset of labour.

The test was repeated in 150 women during the last 15 weeks of pregnancy, using the Huber tocometer. Statistically there was a correlation between the sensitivity of the uterus to oxytocin and the onset of labour. The greater the amount of oxytocin required to produce the first uterine contraction, the longer was the interval before labour began. There was, however, a wide scatter of findings indicating considerable individual variation in uterine excitability. In an individual case, it was not therefore justifiable to make a certain forecast regarding the impending onset of labour. There was no difference between primigravidae and multigravidae.

In 50 women the pregnancy had progressed beyond the expected date of delivery. Prediction of labour within 7 days on the basis of the oxytocin sensitivity proved to be right in 31 cases and incorrect in 19.

As many studies have shown that the various segments of the uterus may differ in their activity it is possible that multi-channel tocography might have yielded better results with the oxytocin test.

Bruce Eton

169. **The Measurement of the Descent and Dilatation of the Cervix During Labour.** (Die "erweiterte Zervix-wehenmessung".)

By H. SIENER. *Geburtsh. u. Frauenheilk.*, **19**, 140–145. Feb. 1959. 6 figs. 8 refs.

The author has already devised an apparatus for measuring and continuously recording the progress of dilatation of the cervix during labour (*Zbl. Gynäk.*, 1956, **78**, 2069). He has now modified this instrument so that as well as the amount of cervical dilatation, the degree of descent can also be measured and recorded.

A light metal arm is fixed to the symphysis pubis and this carries another scissor-like arm of 2 blades, which is inserted into the vagina and through the cervix so that its jaws engage the internal rim of the cervical os. As the cervix dilates the jaws of the lever are separated, this movement is communicated to a pneumatic tambour, so that it can be recorded on a kymograph. In addition the cervical arm is able to move down the vagina with each contraction and by means of a hinge joint it operates a second pneumatic tambour, so that descent of the cervix can also be recorded on a kymograph. The author has used this instrument in conjunction with an external tocograph to record continuously the progress of labour.

Peter J. Huntingford

170. **Studies to Detect the Escape of Amniotic Fluid into the Maternal Circulation During Parturition.**

By R. A. SPARR and J. A. PRITCHARD. *Surg. Gynec. Obstet.*, **107**, 560–564. Nov. 1958. 1 fig. 8 refs.

This investigation from Dallas, Texas, was designed to determine whether slight or moderate amounts of amniotic fluid regularly, or even occasionally, escape into the maternal circulation during labour or delivery without producing clinical evidence of such an escape.

Maternal red blood cells labelled with radioactive sodium chromate and introduced into the amniotic sac were used as a "tag" to detect any transfer of amniotic fluid into the maternal circulation. A measured volume ranging from 20–40 ml. of labelled red cells suspended in saline was injected through the abdominal wall into the amniotic sac. Suitable tests showed that neither lysis nor considerable alteration of the cells took place in the amniotic fluid.

Thirty-eight patients were investigated in this way, 13 prior to repeat Caesarean section and 25 early in labour or prior to induction of labour. Maternal blood specimens were collected before and during labour and after delivery and a well type scintillation counter was used to detect radioactivity. In none of the specimens was there a significant degree of radioactivity. From this the authors conclude that normally there is very little if any escape of amniotic fluid into the maternal circulation during labour or delivery. They believe that the presence of squamous cells or other amniotic fluid debris in the vessels of the maternal lungs is always indicative of a pathological process.

John P. Erskine

171. **Slow Intravenous Infusion of Posterior Pituitary Extracts in Labour.** (Perfusion intra-veineuse lente de post-hypophysaire au cours du travail.)

By. R. MERGER, J. MELCHIOR and CHICHA. *Gynéc. Obstét.*, **57**, 349–361. 1958. 5 tables. 2 refs.

This paper reports on the results of 2,000 cases observed over a period of 8 years by the authors in the Centre Foch in Paris. The authors set out to collect this large number of cases to decide on the worth, the indications for, the contra-indications and the best method of use of intravenous posterior pituitary oxytocic drugs.

In the early cases naturally occurring drugs were used. In the latter cases synthetic syntocinon was used with apparently identical results. Oxygen was often used in addition; and the infusion was always stopped if cyclopropane anaesthesia was given. The indication for use in 72·4 per cent of the cases was dystocia due to weak uterine action. The authors insist that in hyperactivity of the uterine muscle the use of oxytocic drugs is absolutely contra-indicated.

In 1,300 vertex presentations spontaneous delivery occurred in 78 per cent of cases. Forceps delivery occurred in 20 per cent of cases, which the authors state is a high figure, but then these are cases of inert uterine action. Caesarean section was performed in 1·3 per cent.

There were two cases of ruptured uterus; one occurred in a difficult forceps delivery and was possibly due to the forceps operation, the other occurred in a 6-para. The authors consider that no multipara who has had 4 children or more, should ever be given oxytocic drugs in labour.

Foetal mortality was 0·5 per cent in vertex presentations, which the authors claim is a lower foetal mortality than they would have obtained otherwise. They state that infusions started earlier in labour do not shorten labour to less than the *average* time, but they do allow inert labours to be completed more quickly than they would have been otherwise.

On the average, the quantities injected were "small" by French standards and were usually of under 5 units in all. The authors used the method even in 96 cases of foetal distress and in these cases the quantity injected appears to have been smaller still. The authors also used the method in 115 breech deliveries with only 2 stillbirths, one due to spina bifida and the other to trouble with the after-coming head. In addition 17 twin deliveries, 11 premature deliveries, 43 trials of labour, 67 cases of hypertension and 322 special experimental cases were reported on.

In the whole series, there were three uterine ruptures, the third one being in a woman who had already had a classical Caesarean section. This, of course, also constitutes a contra-indication. All three uterine ruptures were re-sutured, and none of the women had to have hysterectomy. Two out of the three children survived.

The authors claim several times in the paper that there is no place for intravenous oxytocic therapy except in a properly equipped maternity unit. They recommend that the transfusion should always be started very slowly to avoid unexpected sudden tonic contractions, and that the pituitary extract should be well mixed with the infusion solution before the injection is started. They state that the uterine action and the condition of the foetus must be very carefully observed, and that it is stupid to continue the infusion if it is not effective. Large doses and lengthy infusions are no more likely to be effective.

The claim is made that total perinatal mortality has been reduced from 3·4 per cent to 1·6 per cent as a result of the intelligent use of posterior pituitary extracts by intravenous transfusion *in properly selected cases.*

Elliot E. Philipp

172. **Clinical Evaluation of the Analgesic Effect of Phenergan in Labor.**

By W. J. FITZGERALD, R. R. GARCIA and J. J. CASSIDY. *Obstet. Gynec.*, **12**, 703–704. Dec. 1958. 1 table. 2 refs.

Four hundred and fifty patients were given Demerol 75 mg. and Phenergan 25 mg. intramuscularly when in labour.

This medication relieved emotional stress and apprehension, gave satisfactory analgesic effect, produced no uterine inertia, lowered the incidence of nausea and vomiting, shortened labour by an average 4½ hours, and caused no untoward effects. *J. G. Dumoulin*

173. **Use of Promethazine (Phenergan) Hydrochloride in Obstetrics.**

By J. J. CARROLL and R. S. MOIR. *J. Amer. med. Ass.*, **168**, 2218–2224. Dec. 27, 1958. 6 figs. 9 refs.

The authors have investigated a number of compounds credited with a relaxant action on the cervix. Having found the action of chlorpromazine most unpredictable they began to use promethazine combined with meperidine and found that this combination was highly effective as an analgesic during the first stage of labour. From the Grace Hospital they report upon 7,500 obstetric patients treated with promethazine (25 to 100 mg. by deep intramuscular injection). The first dose was given when the patient began to complain unduly, regardless of the extent of dilatation, and 50 mg. of meperidine added when distress became more severe. The hospital charts of these patients were compared with those of obstetric patients delivered before promethazine was used. The neonatal and foetal mortality rates were not altered, and in fact the pulmonary neonatal rate showed a definite improvement. Cord blood samples indicated that promethazine either did not enter the placental circulation or did so in insignificant amounts.

Promethazine has antihistaminic, antiemetic, and atropine-like properties. It has a suppressive action on the alerting response to pain and encourages relaxation in the parturient. It also potentiates the action of all other anaesthetic agents. The authors conclude that promethazine is a safe and efficient tranquillizer, it renders labour less unpleasant, and reduces the need for other analgesics having undesirable side effects.

D. W. James

MATERNAL MORTALITY

174. **Maternal Mortality and Its Prevention.** (Mortalita materna e sua prevenibilita.)

By A. RUSSO. *Ann. Ostet. Ginec.*, **79**, 1175. Nov. 1957. 3 figs. 67 refs.

This extensive review of maternal mortality with special reference to its prevention is based on 28 maternal deaths which occurred in 10,987 deliveries of infants weighing more than 1,000 g. in the Obstetrical and Gynaecological Clinic at Turin in the years 1950–56.

The causes of maternal death may be divided into two categories. First there are those directly attributable to childbirth, the "specific risk" including conditions such as haemorrhage, infection, shock, toxaemia, rupture of the uterus, etc. Secondly, there is the "aggravated risk", in women suffering from diseases such as heart disease, diabetes, tuberculosis, hypertension, nephritis, acute intercurrent infections, embolism, new growths, etc.

It is pointed out that in the period under review, maternal mortality fell more sharply in the United States and Great Britain than in Italy.

Analysis of the 28 deaths in the series under review shows that about half these maternal deaths could be described as preventable. In these cases death occurred either on account of inadequate antenatal care or as a result of delayed admission to hospital.

Josephine Barnes

INFANT

175. **The Air Hygiene of Obstetrical Unit Nurseries.**

By H. T. KNIGHTS. *N.Z. med. J.*, **57**, 487–495. Oct. 1958. 2 photographs. 1 fig. 33 refs.

An investigation into the spread of airborne infection in 18 nurseries of 15 institutions was made. Some were old buildings, others were modern in construction, some were teaching hospitals, while others were cottage hospitals. The air slit sampler devised by Bourdillon, Lidwell and Thomas was employed and staphylococci isolated were phage typed at the National Health Institute. Despite the wide range in sizes of nurseries examined, the results were fairly uniform, and averaged 203 bacteria-carrying particles per cubic foot at the time of bathing infants. A quiet nursery, when only one baby was being changed at a time, had an average of 24 bacteria-carrying particles per cubic foot, but when several babies were attended to, the count rose rapidly. Among the bacteria in culture were numerous coagulase-positive staphylococci, and very frequently the 80/81 phage type was isolated. The enumeration of the 80/81 phage type was only performed later in the investigations, but in eight nurseries tested, it averaged 4 per cubic foot. In addition to its wide dispersal, the resistance of this type of staphylococcus to cleaning and fumigating procedures was high.

The author suggests that the most important factor which is likely to reduce the size of the susceptible community is to eliminate bathing babies *en masse* at one time. An alternative is to bath each baby in a cubicalized nursery, or else to eliminate the nursery and practise "rooming-in". *L. Woodrow Cox*

176. **Breast-feeding.**

By H. DEEM and M. MCGEORGE. *N.Z. med. J.*, **57**, 539–556. Dec. 1958. 9 tables. 3 figs. 34 refs.

Three national surveys of breast-feeding in New Zealand in 1939, 1945 and 1952 have showed a progressive decline in the incidence of breast-feeding. A limited survey of mothers confined at the Queen Mary Maternity Hospital, Dunedin, between 1952 and 1954 was carried out to assess the value of various factors in the establishment of lactation. During this time the methods advocated by Waller were introduced. A nursery sister was appointed, and she met prospective mothers at the antenatal clinic, instructed them in the technique advised by Waller, and was responsible for the supervision of infant feeding in the wards. Postnatal check of mother and child was undertaken six weeks after confinement, and in addition 95 per cent of all mothers confined were followed up by nurses of the Plunket Society for more than six months after their discharge from hospital. Eight hundred and ninety-two consecutive cases were surveyed, the only exclusions being those of illegitimate babies for adoption, and of neonatal deaths. Seven hundred and ninety of these patients were followed until weaning. The results, briefly, were as follows: 76·0 per cent of the babies left hospital fully breast fed, 14·8 per cent partially breast fed, and 9·2 per cent artificially fed. In the national survey of 1951–52 the corresponding percentages were 71·6, 9·2, 19·2. At the end of six months, 13·8 per cent were still fully breast fed.

The paper gives in detail the reasons for artificial feeding, and for the failure of breast-feeding. Of infants artificially fed, 43·9 per cent had primary failure of lactation, 20·7 per cent had lactation suppressed because of physical disease such as tuberculosis, 19·6 per cent had defective nipples, and in 13·4 per cent of cases the mother refused to breast feed her baby. Also given in detail are the prospects for successful breast feeding in those mothers in whom complement was given on discharge from hospital, and the reasons for weaning before the sixth month of infant life. An important factor in failure of lactation is tiredness and difficulty with the household duties, domestic help being difficult to obtain in New Zealand.

Also recorded in the paper is a statistical analysis of milk intake of infants in relation to birth weight, and also to the quantity of milk available in the breasts.

This paper shows that an enthusiastic team, with a sympathetic and encouraging outlook, can reverse the trend to artificial feeding. Careful attention to the breasts during the antenatal period, and particular help given to the establishment of lactation during the first pregnancy is likely to produce better results in the long term.

L. Woodrow Cox

177. **The Problem of Erythroblastosis in the Light of Modern Investigations.** (Das Erythroblastose-Problem im Lichte der neueren Forschung.)

By W. SCHEFFLER. *Zbl. Gynäk.*, **81**, 134–140. Jan. 24, 1959. 2 tables, 70 refs.

The author reports the results of a series of 101 cases of erythroblastosis. Induction of labour does not seem to have been used as a method of treatment, as spontaneous labour was awaited in 95 cases and Caesarean section performed in 6. Three transfusions and 89 exchange transfusions were carried out. No child delivered by Caesarean section was lost. The mortality amongst the cases delivered vaginally after spontaneous labour was remarkably low, i.e., 14·6 per cent (9 stillbirths and 5 neonatal deaths). The vast majority of children derived from first-affected mothers.

The paper includes a discussion of the immunological problems arising in cases of Rh incompatibility.

Bruce Eton

178. **Hydrops Foetalis Due to Blood Incompatibility.** (Les anasarques foeto-placentaires par incompatibilité sanguine.)

By G. DAVID. *Gynéc. Obstét.*, **57**, 362–379. 1958. 6 tables. 1 ref.

This paper deals with 19 cases of hydrops foetalis treated by replacement transfusion with 8 surviving children, of whom 7 appear to be normal. The author states that most of these cases were those that would otherwise have been sure to die and were virtually moribund at delivery. In fact, the first case was undertaken as a measure of despair. In this instance the baby weighed 3,500 g. and the placenta weighed 1,000 g. It was typically hydropic. The heart was beating well, but respiration was hardly established. The first step was to tap the abdomen to relieve the ascites and 40 ml. of very yellow liquid flowed out. Forty-five minutes later replacement transfusion was started. On cutting the cord, blood flowed from all three vessels very fast and the quantity could not be measured. Then 500 ml. replacement transfusion was carried out without any attempt being made to replace the blood that had been lost on cutting the cord. Eight hours later another replacement transfusion of 600 ml. was carried out and 15 hours after this a third replacement transfusion of 600 ml. A fourth replacement transfusion (quantity not indicated) was given at the 36th hour of life and at this time the serum bilirubin was said to be 26 mg. per cent. This child is now 2 years old and apparently is normal.

All the other cases were treated similarly, except that in one case hydrocortisone hemisuccinate 5 mg. was also given 17 hours after delivery and at 22 hours after delivery.

The author proceeds to describe the clinical and biological features of these cases and emphasizes the fact that it is rare for respiration to be established easily after delivery, although the heart is beating forcibly.

The blood counts are described and it is pointed out that there may be as few as one million red blood cells per c.mm., with a haemoglobin of 40 per cent, and that this is due to the very high number of erythroblasts and to great macrocytosis. Several pages are devoted to theorizing as to the causes of the pathological changes.

Elliot E. Philipp

179. **Weight of the Newborn in Heterospecific Pregnancy.** (Das Körpergewicht des Neugeborenen bei heterospezifischer Schwangerschaft.)

By W. Mosler. *Zbl. Gynäk.*, **81**, 33–37. Jan. 10, 1959. 2 tables. 2 figs. 17 refs.

The author studied a series of 500 children, 350 derived from homospecific and 150 from heterospecific pregnancy, i.e., in which the blood group of the mother differed from that of the child. Cases of Rh incompatibility and premature births were excluded.

There was no significant difference in birthweight between the two groups of children. The initial weight loss averaged 7·15 per cent in homospecific and 7·48 per cent in heterospecific cases. There was very little difference in the behaviour of the weight curve until the 6th day of life after which the children of heterospecific pregnancy gained at a distinctly slower rate than the other group.

The author attributes this difference partly to the fact that after heterospecific pregnancy iso-agglutinins persist longer in breast milk than they do after homospecific pregnancy.

Bruce Eton

180. **Hyperbilirubinaemia in Prematurity.**

By G. H. Newns and K. R. Norton. *Lancet*, **2**, 1138–1140. Nov. 29, 1958. 4 figs. 1 table. 32 refs.

In infants with haemolytic disease death from kernicterus occurs before the 4th day of life; but in premature babies death is later at about the 5th–10th day. A study has been made of the bilirubin levels in all premature infants who developed jaundice and also in other babies who became deeply jaundiced in the first 3 days. Fifty-two premature babies and 16 "full-time" babies were investigated. The bilirubin level was 20 mg. per 100 ml. or more in 10 of the 16 "full-time" babies and 24 of the 52 premature babies. The highest bilirubin levels were found in babies of 32 weeks gestation or less. Exchange transfusion was performed on 8 of the premature babies and one of the "full-time" babies on account of high bilirubin level or signs suggesting early kernicterus. The authors conclude that the risk of kernicterus is undoubtedly high when bilirubin levels rise above 30 mg. per 100 ml. and almost negligible when they are below 18–20 mg. per 100 ml. They therefore suggest an exchange transfusion for all infants whose serum-bilirubin reaches a level of 30 mg., or if there are signs of early kernicterus, or if there is a rapid rise of serum-bilirubin on the 3rd or 4th day.

H. H. Fouracre Barns

181. **Exchange Transfusion in Neonatal Hyperbilirubinaemia.**

By J. O. Forfar, A. J. Keay, W. D. Elliott and R. A. Cumming. *Lancet*, **2**, 1131–1137. Nov. 29, 1958. 3 figs. 6 tables. 20 refs.

In icterus gravis neonatorum high serum-bilirubin levels have a well recognized association with kernicterus. Hyperbilirubinaemia may also be found in premature babies. The cause of this latter type of hyperbilirubinaemia is not fully understood but it is thought to be related to hepatic immaturity. No satisfactory way of preventing the rise in serum-bilirubin in immature infants has been discovered and the only treatment in common use has been the removal of circulating serum-bilirubin by exchange transfusion. Forty-five such transfusions were performed on 37 infants, in 9 of whom there was evidence of Rh incompatibility. No transfusion was undertaken before the second day of life. Of the other 28 infants, 26 were premature. Serum-bilirubin was estimated in all infants whose jaundice judged visually appeared to be approaching the critical level of 18 mg. per 100 ml. From the observations made on the series it was found that exchange transfusion in the region of 80–90 ml. per pound body weight given at a rate of 0·8 ml. per pound per minute was the most efficient for removing bilirubin from the infant. It was found that there was a post-transfusion anaemia and the lowest levels were reached at about the 6th week of infant life, when the mean level was 8·1 g. haemoglobin per 100 ml., which compares with a mean level of 10 g. found in premature infants at the 11th week. Two infants died during exchange transfusion quite suddenly. No abnormality was found post-mortem. The survivors followed up for periods ranging from 6–24 months were found to progress satisfactorily.

The authors conclude that exchange transfusion appears to be a satisfactory method of removing bilirubin from an infant's circulation.

H. H. Fouracre Barns

182. **Thrombosis of the Renal Veins in the Newborn.** (Trombosi nelle vene renali nel neonato.)

By C. C. Ronchetti. *Ann. Ostet. Ginec.*, **79**, 1295. Dec. 1957. 2 figs. 73 refs.

The literature is extensively reviewed and 37 cases from the literature are tabulated.

A case is described where thrombosis of the right renal vein occurred in an 8-day old infant. The child was ill and showed haematuria, fever, enlargement of the affected kidney, and raised blood urea. After several days the child's condition improved. Subsequent pyelography showed that the right kidney was one-third the size of the left which was normal. Nephrectomy is the correct treatment in cases where the condition is unilateral.

Josephine Barnes

183. **Influence of Sex of the Full-term Newborn Infant on Oestrogen Excretion.** (Influence du sexe sur la courbe d'élimination des oestrogènes chez le nouveau-né à terme.)

By J. de Blieck and J. Schwers. *Bull. Soc. roy. belge Gynéc. Obstét.*, **28**, 476–482. 1958. 1 table. 2 figs. 5 refs.

The authors studied the urinary elimination of oestrogens in 12 full-term newborn infants and concluded that:

(1) Practically the whole amount of oestrogens is eliminated as oestriol.

(2) The elimination is greatest during the first three days.

(3) Female babies eliminate two times more oestriol as male children. A peak is reached later by female infants.

From the Authors' Summary

184. **Oestrogen Metabolism in the Foetus and Newborn.** (Métabolisme des oestrogènes chez le foetus et le nouveau-né.)

By E. DICZFALUSY. *Bull. Soc. roy. belge Gynéc. Obstét.*, **28,** 459–475. 1958. 17 figs. 42 refs.

During the last five years the oestrogen metabolism of the human foetus and newborn child has been thoroughly studied in Stockholm. The author suggests that the human foetus takes an active part in the intermediary metabolism of oestrogens during pregnancy. The oestrogen metabolism of the human foetus and infant may differ from that of the adult.

From the Author's Summary

185. **Follow-up Study of Children Born after Operative Delivery.** (Geburtshilfliche Operationen und das retrospektive Schicksal der so geborenen Kinder.)

By H. ANDREAS. *Zbl. Gynäk.*, **81,** 145–151. Jan. 31, 1959. 7 tables. 18 refs.

The author investigated the physical and mental condition of 325 children born 7 to 11 years previously by operative delivery. The investigation included simple intelligence tests, examination of school reports, statements by the parents and, in doubtful cases, additional information collected from the family practitioner.

Of 100 children delivered by forceps, 9 died during or soon after delivery. Forty-seven were subsequently traced and of these 5 had died from intercurrent diseases. Five were found to have abnormalities of which 4 could be attributable to forceps delivery.

Of 112 children who required manual assistance during delivery, 15 died during or soon after labour. Of 61 traced subsequently, 3 had died from intercurrent disease and 3 showed abnormalities, 2 of which could be attributable to birth trauma.

Fifty-one children were delivered by version and extraction, with a perinatal mortality of 53 per cent. Of the 24 survivors 20 were traced, 4 had died from intercurrent disease and 1 was mentally retarded.

Amongst 62 children delivered by Caesarean section (a Caesarean section rate of 1·42 per cent) there were 5 perinatal deaths. Thirty-five children were traced, 3 had died from intercurrent disease and 3 of the survivors suffered from conditions which might possibly be attributable to birth trauma.

The author points out that the abnormalities observed in these children could have been produced by clinically symptomless or undiagnosed meningitis or by encephalitis which occasionally complicates the virus infections of childhood.

The significance of the findings is reduced in the author's own opinion by his observation that there was a direct relationship between the incidence of physical and mental abnormalities and the social and environmental conditions of the children.

[This study would have been more useful if it had included a series of controls.]

Bruce Eton

186. **Care of the Newborn after Caesarean Sections Under Endotracheal Anaesthesia.** (Die Betreuung der Neugeborenen nach Schnittentbindungen in Intubationsnarkose.)

By R. SCHWARZ. *Zbl. Gynäk.*, **81,** 13–16. Jan. 3, 1959. 30 refs.

Contrary to previous conclusions based on experimental work it is now generally recognized that muscle relaxants administered to the mother are transmitted to the foetus.

Succinylcholine can produce a rapidly subsiding apnoea in the newborn. The longer acting curare and Flaxedil were seen, at the Freiburg Clinic, to be followed by total respiratory paralysis. In view of the difficulties of demonstrating curare in the foetal urine its placental transmission has been demonstrated indirectly but "unequivocally" by recording intra-uterine foetal movements.

In the first series of 51 sections, 3 cases of total and 4 cases of partial respiratory paralysis of the newborn were seen and in 3 other cases a delayed paralysis after some 20 minutes of spontaneous respiration. These observations led to a critical study of the methods used in the Department. Measurable amounts of relaxants were detectable in the foetal circulation 6 minutes after injection.

The following routine was adopted: two anaesthetists were present at the beginning of the operation, and one took care of the child after its birth. If long-acting muscle relaxants of the curare group were administered to the mother, the child received in every case an intramuscular injection of 0·25 mg. of "Neoeserin" (prostigmine) and 0·05 mg. of atropine, even if respiration started spontaneously. Under direct vision by means of a laryngoscope, the nose, mouth, pharynx, stomach, larynx, trachea and main bronchi were aspirated, and then pure oxygen was introduced by means of a tube. The child remained under continuous medical supervision during the next hour. If respiratory difficulties recurred, further inspection with the laryngoscope and, if necessary, aspiration were carried out and if secretions were found to be responsible for them, the child was given a second injection of "Neoeserin" and atropine at half the previous dose.

The delayed effect of curare is attributed to the rapid metabolism of "Neoeserin". Fifteen to thirty minutes later respiration may again become paralysed because some of the relaxant has not yet been excreted by the kidneys.

Bruce Eton

187. **Deafness Following Maternal Rubella.**

By A. D. M. JACKSON and L. FISCH. *Lancet*, **2,** 1241–1244. Dec. 13, 1958. 1 fig. 5 tables. 11 refs.

Fifty-seven surviving children between the ages of 3 and 5 years from the counties of London and Middlesex whose mothers had rubella during the first eighteen weeks of pregnancy were investigated for deafness and compared with a control group of 57 children whose mothers had no infection during pregnancy. Hearing was tested for a wide variety of sounds covering as many frequencies as possible. Fifteen children in the rubella group had major congenital defects, 14 of whom had congenital deafness, giving an incidence of 26·3 per cent for major defects and of 24·5 per cent for congenital deafness. There was no significant correlation between the severity of deafness and the severity of the maternal rubella or to the stage of pregnancy at which rubella occurred. Only 3 children had major congenital defects other than deafness. Nine of the 14 cases of congenital deafness had not been detected previously and this stresses the importance of detailed hearing tests. In a third of the cases affected the deafness was unilateral.

H. H. Fouracre Barns

188. **Vitamin E in the Prophylaxis of Congenital Anomalies.**

By E. SHUTE. *Fertil. Steril.*, **9**, 256–268. May/June 1958.

This is a general survey by one who has a special interest in vitamin E. In the prologue the author points out that in 1939 congenital malformations caused 12,413 deaths in the United States, and that in 1953 the deaths were 20,012. It is estimated that 7 per cent of live born infants show congenital anomalies by the time they are 1 year old. Hitherto this problem has been regarded fatalistically, and since it is a well-known fact that abortion in at least 15 per cent of cases is due to a developmental error, there has been little tendency to interfere with nature, which the author considers the height of obstetric laissez faire. With the object of prevention, Dr. Shute earnestly advocates that, since the structure of the child is settled at the moment of conception, at least the male should be given alpha-tocopherol, which vitally improves the sperm of a sire, for some weeks or days before the act of coitus, associated with family planning, is determined upon.

His argument is that spermatozoa are designed to fertilize ova, not to run races on glass slides, and that those of a man who is sedentary, improperly nourished, or tobacco saturated, are lacking virility and potentiality. Such can be very greatly improved by the exhibition of 50–75 I.U. of vitamin E daily for at least 2 weeks before the chance of conception, and he goes on to quote the work of Moench and others who have demonstrated that lack of vitamin E induces testicular degeneration. He concludes by recording 355 pregnancies in 110 families in which there were 63 abortions and 133 delivered anomalies. It should always be remembered that the occurrence of one anomaly increases the likelihood of a second occurring by 7 times. He goes on to adumbrate that slightly abnormal sperms may be the cause of some of these congenital defects, and therefore there exists an additional reason for giving vitamin E in cases where sperm analysis had shown that the husband was on the border line.

To prove this he gives the history of 19 patients who had had anomalous infants where the husband was given vitamin E previous to conception, and in 17 of these 19 controlled pregnancies, normal infants were produced.

V. B. Green-Armytage

189. **Therapeutic Aspects of Perinatal Mortality.** (Therapeutische Aspekte der perinatalen Sterblichkeit.)

By W. BEUTL. *Zbl. Gynäk.*, **80**, 2013–2027. Dec. 27, 1958. 2 figs. 6 tables. 18 refs.

This is a study of 685 stillbirths and neonatal deaths occurring up to the 10th day post-partum, an incidence of 3·6 per cent amongst 19,044 births between the years 1950 and 1955. Four hundred and fifty of the cases were premature (65·7 per cent).

A third of all deaths occurred before the onset of labour. In spite of careful scrutiny, the cause of intra-uterine death could not be determined in 85 cases (12·4 per cent). Anoxia played a part in 45 per cent of deaths. It is stated that prophylaxis against anoxic conditions includes meticulous antenatal care, rest, exercise in the fresh air, training in relaxation and administration of oxygen in labour to any patient suffering from toxaemia or any other condition liable to produce foetal anoxia. Well-known routine measures for the resuscitation of the newborn are listed, including aspiration of gastric contents and Eve's rocking method.

A critical study of cases of prolonged pregnancy indicated that factors additional to postmaturity contributing to the death were present in all but 16. During the years 1950–1953, induction for prolonged pregnancy was carried out in 1·4 per cent of all patients, provided it was certain that labour was 3 weeks overdue.

There were 45 cases of tentorial tears with cerebral haemorrhage. Nineteen of these followed unassisted spontaneous delivery, and are attributed to excessive uterine contractions, insufficient guarding of the perineum and too rapid release from the vulval constriction of the previously compressed head.

Amongst deaths attributed to toxaemia only 10 per cent of children weighed more than 2,500 g., with an average birth weight of 500 g. less than that of children of the same maturity in normal pregnancy. It is pointed out that every time operative delivery is contemplated before term this difference in weight ought to be kept in mind.

Bruce Eton

GYNAECOLOGY

190. **The Development of Paediatric Gynaecology in Czechoslovakia.** (Desvoltarea ginecologiei infantile in Cehoslovakia.)

By K. VESELY. *Obstet. Ginec.* (*Bucarest*), 193–195. June 1958. 4 refs.

The University College "Carol" in Prague, under the

directorship of Prof. Rudolf Peter, was founded in 1940, and was the first unit where gynaecological studies of infants and children up to the age of 14 have been systematically made.

In 17 years 17,000 children have been examined in the out-patient department. Paediatric gynaecology has an important place in preventive medicine in relation to health and fertility in adult women. It is also concerned with education in hygiene, and sexual development.

Paediatric gynaecology includes physiology and pathology. Referring to the biology of the genital organs, the author describes the development in three stages: (1) hormonal stage of the newborn, (2) genital quiescence, (3) sexual maturity. In the pathological group, the chief problem was that of discharge in children. Prof. Peter has studied the vaginal flora and has identified the infecting organism in some of these cases as beta haemolytic streptococcus, which was also found in the epidemiology of scarlet fever. In 1,500 cases of vaginal discharge 70 cases had the β-haemolytic streptococci present in the vagina, and half of these cases developed scarlet fever. The highest incidence of this discharge is found round about the age of 7, when the incidence of scarlet fever is also at its highest level.

Discharge was sometimes due to foreign bodies and could be blood-stained and offensive. The *Trichomonas vaginalis* infection has been found in the first and third groups, and in both these groups oestrogens are present. If trichomoniasis is found in the period of quiescence it means the beginning of sexual development.

Special studies have been made of gonorrhoea which is most often seen in the quiescent period; this infection was not transmitted by direct sexual contact, but by indirect contact.

Endocrinological problems were mostly concerned with the diagnosis and treatment of premature puberty, premature pseudo-puberty of suprarenal origin and Turner's syndrome. Fractures of the pelvis have been treated in conjunction with the orthopaedic surgeon to avoid subsequent deformity of the pelvis. In cases of ovarian tumours, the surgery was conservative, except in malignant cases. In this institution there was the closest co-operation between the general surgeons and gynaecologists in such cases as acute appendicitis, so as to avoid the spread of the infection to the genital organs and subsequent sterility. *Sylvia Lerer*

191. **Report on the Work of Gynaecological Consultation Clinics in North Rhine-Westphalia from 1952–1957.** (Bericht über die Tätigkeit der gynäkologischen Konsiliarstellen in Nordrhein-Westfalen in den Jahren 1952–1957.)

By M. WEBER. *Geburtsh. u. Frauenheilk.*, **19**, 119–134. Feb. 1959. 5 tables. 7 figs.

Since 1952, 179 gynaecological consultation clinics have been established in the West German Province of North Rhine-Westphalia. These were set up as the result of a combined effort by the Local Authorities and a Provincial Cancer Committee, in order to detect cancer of the female breast and genital tract as early as possible. An intensive propaganda campaign was instituted and the public were reached by means of leaflets, lectures, films and broadcasts. The general practitioners in the area were acquainted with the scheme and given the opportunity to attend refresher courses and to hear lectures by specialists on diagnostic measures. Doctors were encouraged to refer their patients to the clinics. If patients attended the clinics without being referred by their doctor, a report was sent back to him, asking him to arrange for and supervise any further treatment necessary. Twenty-four point seven per cent of the patients seen in these clinics in 1957 attended at the request of their doctor compared with 11·2 per cent in 1952. The clinics were staffed by consultant gynaecologists from the hospitals in the area.

From 1952–1957, 301,112 patients were examined in the 179 clinics (211,850 were examined once only). During the 6-year period 43 per 1,000 of the female population of the Province over 25 years of age visited the clinics. More than 50 per cent of the women came from the lower social groups and two-thirds of them came from the cities. The reasons the patients attended the clinics were as follows; 50 per cent came for a check-up; 40 per cent attended because of symptoms; only 3 per cent presented themselves for examination because they were worried about cancer.

Colposcopy was performed on 60 per cent of the patients seen, whereas cervical smears were examined from less than 6 per cent, this was because cytological examinations could only be undertaken in one or two centres because of the lack of technical facilities and skilled personnel.

More than half of the patients were found to be quite healthy. In 38 per cent non-cancerous gynaecological lesions were discovered, which required treatment and for which the patients were referred to their own practitioners. Of the 211,850 women examined 3,040 were found to have cancer and of these 493 were found on return visits to the clinics. In 2,730 patients an hitherto undetected primary tumour was found, including 914 cases of carcinoma of the breast and 1,244 cases of carcinoma of the cervix, of which 53 per cent were stage I. In a further 141 and 169 patients, respectively, evidence of a recurrent or metastatic carcinoma was discovered. The paper analyzes these cases in further detail, with regard to symptomatology, age, parity, etc. Details are given of the routine examinations undertaken in the cancer detection clinics (a specimen of the case-sheet used is illustrated), and of the precautions taken to ensure an adequate follow-up. The author considers that the results have justified the establishment of the cancer detection clinics. *Peter J. Huntingford*

FUNCTIONAL DISORDERS

192. **Menstrual Cycle of Women Living in Tropical Climate.**

By S. SHAH. *J. Obstet. Gynaec. India*, **9**, 137–140. Dec. 1958. 5 refs.

This article throws doubt on the commonly held belief that climate influences the time of onset or the duration of the menstrual cycle. Four hundred Indian women attending a clinic complaining of leucorrhoea were questioned about menstruation. Seventy-two per cent of the women began menstruating at 14 or 15 years of age. A 28-day cycle was the rule in the majority of cases, and the duration of the flow was 3 to 5 days.

This, together with previous investigations carried out in the Egyptian and Bantu races, suggests that puberty is not precocious in hot climates. *John McKiddie*

193. **The Stein-Leventhal Ovary: A Manifestation of Hyperadrenocorticism.**

By W. H. PERLOFF, B. J. CHANNICK, H. E. HADD and J. N. NODINE. *Fertil. Steril.*, **9**, 247–255. May/June 1958.

It is one of the most interesting gynaecological findings that patients can show all the features of the Stein-Leventhal syndrome without any obvious ovarian changes; whereas others show no symptoms with the typical oyster or pingpong ovaries. The authors record 7 cases which suggest that the Stein-Leventhal ovary is a manifestation of hyperadrenocorticism, and demonstrate that in some of their cases, prednisone therapy yielded more favourable results as regards hirsutism; menstrual irregularity and level of 17-ketosteroids than did wedge resection of the ovaries alone. They consider that androgenic excess is responsible for the follicular cysts which produce large amounts of oestrogen, and that it is this oestrogen that augments hyperplasia of the adrenal cortex by way of the pituitary. It is for this reason that prednisone benefits the hirsutism and menstrual dysfunction, using doses of 5–10 mg. a day for several weeks. *V. B. Green-Armytage*

194. **The Stein-Leventhal Syndrome.** (Le syndrome de Stein et Leventhal.)

By E. LECLERCQ. *Bull. Soc. roy. belge Gynéc. Obstét.*, **28**, 493–517. 1958. 57 refs.

The author has studied 51 cases of Stein-Leventhal syndrome. Having discussed the endometrial and ovarian pathology he gives a tentative explanation of the pathogenesis of the syndrome. The syndrome is due to a deficient ovulatory mechanism and the persistent follicles give rise to relative hypersecretion of LH. The theca cells, luteinized by this hormone (LH), elaborate abnormal steroids which are held responsible for the clinical picture of the syndrome. Diagnostic procedures are discussed and indications for wedge resection of the ovaries listed. *From the Author's Summary*

195. **Some Reflections on a Case of Gonadal Dysgenesis.** (Quelques reflexions sur un cas de dysgénèsie gonadique.)

By DE LA PENA REGIDOR. *Gynéc. prat.*, **9**, 287–294. 1959. 2 figs. 9 refs.

This article is written around the report of what appears to be a true case of Turner's syndrome with amenorrhoea, poorly-developed breasts and male-type chromatin. The patient also showed mental retardation, which is not uncommon in this syndrome, and a very small sella turcica as well as low urinary F.S.H. levels.

Much of the article is devoted to the discussion of whether the two latter findings invalidate the diagnosis and the net result is somewhat confusing, especially when the author deals with the end organ effects of pituitary dysfunction.

While a considerable section is devoted to the possibility of developmental errors in the genito-urinary tract being the aetiological factor, no mention is made of the possible role of the absence of germ cells.

Those with a special interest in Turner's syndrome and allied disorders will no doubt find the case report of interest. *Geoffrey Dixon*

196. **Panel Discussion: Determination of Sex and What to do About It.**

By R. G. BUNGE, A. ALBERT, E. BURNS and J. G. HAMPSON. *J. Urol.*, **81**, 13–24. Jan. 1959.

Traditionally the sex of the newborn baby is diagnosed by the accoucheur. The tragedies of wrong diagnosis when malformed genitalia exist are well known. It is of great importance that if the doctor is not sure of the sex he should inform the parents immediately.

These cases fall into two groups, namely, the adrenogenital syndrome and the remainder. The adrenogenital syndrome cases are discussed at some length. Certain tests are available which should be carried out without delay, e.g., the chromatin test, estimation of 17-ketosteroids and the estimation of pregnanetriol. If the amount of ketosteroids and pregnanetriol are suppressed by the administration of cortisone and the chromatin test is positive, the diagnosis is highly in favour of the adrenogenital syndrome. The feeling of the panel was that if the diagnosis was positive partial amputation of the clitoris should be done before the child was six months old and construction of the vagina which may be hidden or absent could be postponed until just before puberty.

The rest of the discussion, a valuable one, deals with inter-sex problems in older children. *J. H. Carver*

197. **Cervical Mucus in Infertile Women: Prognostic Value of Findings at First Examination.**

By C. S. STEVENSON. *Fertil. Steril.*, **9**, 407–425. Sept./Oct. 1958.

Ninety years ago Marion Sims wrote that in the investigation of a case of sterility "you must determine whether the secretions of the cervical canal are favourable or not to the vitality of the spermatozoa". This dictum is just as important today and the mucus at the mid-cycle contains fewest leucocytes and shows the highest alkalinity, together with the capacity to maintain

sperms in a state of activity longer than in their own seminal plasma. The problem of the pH is in itself fascinating, for although high alkalinity is present for the first 8 weeks of pregnancy, after this the mucus becomes acid and impenetrable to sperms. There is no doubt that mucus secretion is directly under the control of ovarian hormones, and that it has antibacterial properties. Mucin which has a minimal viscosity and a maximal stretchability, together with glucose, at the mid-cycle, is of importance from the point of view of conception, for should any of these qualities be lacking in any particular woman, then her chances of pregnancy are slender. The author in a careful survey of 84 infertile women concludes that in 65 of these their infertility was essentially either a deficiency of the thyroid gland in 27 or 41 per cent, and of the ovary in 38 or 59 per cent of this group. He noted that in more than two-thirds, the cervical mucus was not up to standard. In some the mucus was scanty or lacking; in some the Spinnbarkeit was less than half it ought to be; and in one-third the pH was lower than 6·6 though curiously enough he considers that the relative clarity of the mucus is of little diagnostic value.

V. B. Green-Armytage

198. **The Treatment of Sterility with Intra-Tubal Injection of Cortisone Acetate in a Sodium Chloride Solution Associated with Antibiotics.** (Tratament sterilitati femenine prin injectii intratubare co solutie cu acetat cortison in suspensie clorura sodica asociata cu antibiotics.)

By H. Ciotoloman, J. Sava, C. Nicoi escu, S. Fischoff, V. Ioanid, V. Petrescu, V. Papanicu, L. Greceanu, A. Jacob and I. Zissu. *Obstet. Ginec.* (*Bucarest*), 221–224. June 1958. 7 refs.

The authors have used this method in cases of tubal occlusion, which in 50–70 per cent of cases is due to infection and is the most frequent cause of sterility.

The technique they used is simple, one injection a week is given through the cervix of 125 mg. cortisone with 4,000,000 U. penicillin (crystalline) at a pressure of about 20–25 mm. mercury. This is done without anaesthesia unless the patient is nervous. About four injections are required and then a hysterosalpingogram is taken.

They have treated 25 cases and the reasons for using this procedure are (1) the mixture of cortisone and antibiotics has a synergistic action on the inflammatory process, (2) it has a mechanical effect on the tubes when blockage is slight, (3) it has a sclerolytic action on the tubes and restores permeability and normal elasticity and contractility.

In conclusion the authors stated that out of 25 cases, in four patients the tubes became patent, and one of these patients became pregnant and carried her pregnancy to term.

Sylvia Lerer

199. **Cortisone in the Treatment of Tubal Occlusion.** (Cortison in der Behandlung der tubaren Sterilität.)

By A. E. Gruber. *Geburtsh. u. Frauenheilk.*, **19**, 78–83. Jan. 1959. 8 figs. 4 refs.

Ten patients with radiological evidence of tubal occlusion of peri-tubal adhesions were treated by repeated intra-uterine injections of 25 mg. of cortisone in 10 ml. of normal saline. An antibiotic [details are not reported] was also included in the mixture. Six doses were usually given, at intervals of a few days, during the menstrual cycle following hysterosalpingography. Two patients became pregnant and were delivered normally at full term. A third patient was found to have a tubal pregnancy 3 months after completing a course of intra-uterine injections. In the remaining 7 patients no pregnancy has yet resulted.

Peter J. Huntingford

200. **Artificial Insemination by Donors: Analysis of Seven Series.**

By R. G. Potter, *Fertil. Steril.*, **9**, 37–53. Jan./Feb. 1958.

This is an excellent and highly critical paper on the methods and results of artificial insemination done by a series of 7 authorities in this line, each of whom of course thinks that his own technique is best; but for those who are interested, or in favour of A.I.D., it is well to bear in mind and be honest enough to admit to any prospective patient, that the success rate of A.I.D., even when done by experts, and repeated quite a number of times, is not more than 68 per cent, and that of A.I.H. not more than 16·5 per cent.

V. B. Green-Armytage

201. **The Endometrium and Sterility.**

By B. A. Foss, H. W. Horne, Jr., and A. T. Hertig. *Fertil. Steril.*, **9**, 193–206. May/June 1958.

For long it has been held by all who are interested in the subject of fertility that faults in the endometrium were not so rare as had been thought hitherto, for during recent years it has been shown that the ovulatory pattern of the endometrium at the 24th–25th day of the cycle was often faulty or inadequate for the nutrition and maintenance of the blastocyst. Indeed, it is probable that less than 70 per cent of women ovulate regularly every month, and faulty function of the corpus luteum, or lack of responsiveness of the endometrium, may be a common cause of infertility and abortion. It remains to be seen whether the modern treatment of priming such patients for the first 10–12 days of the cycle with oestrogens, followed by nor-progestogens in the latter half of the cycle, will help conception in patients who have been scientifically subjected to biopsy.

V. B. Green-Armytage

202. **Diagnostic Value of Oil Salpingography in the Study of Sterility: A Preliminary Report.**

By J. P. Arcomano and J. C. Barnett. *Fertil. Steril.*, **9**, 215–221. May/June 1958.

The author, as a result of 412 salpingograms for cases of infertility in the Kings County Hospital, Brooklyn, N.Y., using only iodized oil, concluded that 80 per cent of his patients had normal Fallopian tubes, the remaining 20 per cent of cases included tubal diverticula, fimbrial occlusion and like pathology.

His opinion is that salpingography is more scientific and of better therapeutic value than insufflation with carbon dioxide. *V. B. Green-Armytage*

203. **The Effects of Light on Uterotubal Insufflation: Preliminary Report on Six Cases.**

By W. Z. Polishuk. *Fertil. Steril.*, **9**, 450–459. Sept./Oct. 1958.

This is an intriguing paper in which the author points out that in 17 out of 300 consecutive cases submitted to carbon dioxide insufflation tubal occlusion was demonstrated, but when a hysterosalpingogram was performed later, normal tubal patency was shown. As all these cases of insufflation were done in the daylight under antispasmodics, the author wondered if daylight was anything to do with such disparity of results, arguing that the increased tone and spasm of the Fallopian tubes was perhaps due to the secretion of a pressor hormone by the pituitary, for when the insufflations in 6 cases were repeated in the dark with the eyes tightly closed, tubal patency and normal oscillations were seen in the kymograph. *V. B. Green-Armytage*

204. **Eight Hundred Semen Analyses.**

By C. O. McCormick, Jr. *Fertil. Steril.*, **9**, 54–59. Jan./Feb. 1958.

The author of this paper is well known for his lucidity, and so his findings on the analyses of 646 unselected husbands must be accepted as important, seeing that the wives of these husbands were all complaining of involuntary infertility. The author was able to reveal that 54 per cent of these husbands were either a contributant or absolute factor in their wife's barrenness. It is interesting that he was able to confirm that the exhibition of thyroid and vitamin B was of considerable value in a small percentage of husbands, and should always be employed tentatively for the male, though vitamin E for the wife is useless. *V. B. Green-Armytage*

205. **A Comparative Analysis of the Most Important Seminal "Indices of Fertility".** (Analisi comparativa dei piu noti "indici di fertilitata" seminale.)

By G. Ballerio. *Ann. Ostet. Ginec.*, **79**, 103. Feb. 1957. 6 refs.

On the basis of the examination of seminal specimens from 75 out-patients in the Fertility Clinic at Milan, a comparison is made of six different "indices of fertility"; by these it is possible to divide patients into fertile, doubtfully fertile and probably infertile.

The indices considered are those of Girola (1950, 1953), Hinglais and Hinglais (1947), Farris (1949), McLeod (1951), Page and Houlding (1951) and Casares-Ponce and Botella-Llusia (1953).

Girola's index is calculated on the formula $\frac{C \times Q \times D \times A \times V}{M}$. The minimal normal value is 2·40 where C is the number of sperms in 1 ml., Q the volume expressed in ml., D the basal motility, or percentage of motile elements expressed in decimals after one hour, A the index of activity after 12 hours (30 per cent motility at 3 hours is represented by the Figure 1, and 30 per cent motility at 12 hours by the Figure 4), M the index of abnormal types (Figure 1 indicating 80 per cent of normal forms and Figure 4 20 per cent of abnormal types) and V is the index of viscosity, based on the mesomucinase activity.

Hinglais's index is calculated on the formula:

$$\frac{C \times M \times N \times V}{10^9}$$

where C is the concentration of sperms per ml., M is the percentage of motile forms one hour after ejaculation; N is the percentage of morphologically normal sperms and V is the index of activity, based on at least 30 per cent of motile elements with an arbitrary index of 1 to 4. Normal sperm should give an index of at least 2·50, though 2·00 is now considered within normal limits.

Farris's index is calculated on the formula $V \times N \times M/100$ where V is the volume of the ejaculate in ml., N is the number of inactive and active sperms per ml., and M is the percentage of active sperms. A value of 125 or over is considered to indicate fertility.

McLeod's formula is as follows: $A \times M \times Nt$ where A is the motility after 12 hours expressed in an arbitrary index similar to that of Hinglais, M represents the percentage of motile sperms and Nt is the total number of sperms in millions. A value of 30 millions is considered to be normal.

Page and Houlding's index is calculated on the formula $C \times M \times Nc$ where C is the concentration of sperms, M the percentage of motile sperms and Nc the percentage of sperms with morphologically normal heads. A figure of 50 is regarded as normal.

Casares-Ponce and Botella-Llusia's formula is devised as follows:

$$\frac{M \times N \times V}{A \times 10^9}$$

where M is the percentage of motile elements, N is the number of sperms per ml., V represents vertical progress in mm. per 30 minutes and A the percentage of normal forms. The lower limit of normal is 0·45.

All six indices can be used to divide seminal specimens into fertile, doubtfully fertile and probably infertile. The author considers that those of Girola and Hinglais, while more exacting to determine, give on the whole the most accurate picture. Tables are given to illustrate the practical application of the various indices.

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Josephine Barnes

INFECTIONS OF THE REPRODUCTIVE ORGANS

206. **A Case of Complete Obliteration of the Uterine Cavity Due to Tuberculosis.** (A propos d'un cas de synéchie utérine totale d'origine tuberculeuse.)

By A. DE MORAES. *Gynéc. prat.*, **9**, 277–285. 1958. 6 figs. 19 refs.

This case report is concerned with a 25-year old woman who presented with secondary amenorrhoea of 9 years duration and primary infertility for 6 years. The menarche had occurred at 13 years but the periods were irregular and scanty until they ceased at 16 years. Many courses of hormonal therapy had been given without success. At the age of 15 the patient had suffered from pleurisy.

General examination and investigation were essentially normal but it was not possible to pass a sound into the uterus and the uterus itself was small and showed somewhat limited mobility. A first attempt at hysterosalpingography failed as no oil entered the uterus. A repetition after dilatation of the cervical canal produced massive venous extravasation and showed an occluded uterine cavity. After several attempts, an endometrial biopsy was obtained. This showed tuberculous granulation tissue and culture and guinea-pig inoculation were both positive.

The patient has been treated with streptomycin, PAS and INAH combined with intra-uterine instillations of hydrocortisone. There has been no symptomatic improvement but endometrial biopsy now shows fragments of normal glands and connective tissue. The author hopes at some time in the future to free the adhesions after hysterotomy and restore a normal uterine cavity.

Geoffrey Dixon

207. **Epidemiology of Trichomonas Vaginalis Vaginitis: A Progress Report.**

By C. L. BUXTON, D. WEINMAN and C. JOHNSON. *Obstet. Gynec.*, **12**, 699–702. Dec. 1958. 3 refs.

This is a preliminary report on an investigation into the epidemiology of *Trichomonas vaginalis* vaginitis. It is estimated that 20–25 per cent of women in America are chronically or intermittently infected by this organism.

Of 465 women employees of a large insurance company in a city, two-thirds were married. Of the married 6·3 per cent, and of the unmarried 1·4 per cent, were found to be infected. Infection was more common in the menstruating women than the post-menopausal.

In 575 routine gynaecological out-patients, 80 per cent of whom were married, the incidence of trichomonas infection was 6·9 per cent.

The incidence in 715 inmates of mental institutions was 15 per cent, and in 221 female prisoners 70 per cent.

No infection was found in 157 undergraduates of a women's college.

These figures suggest that sexual contact and lack of hygiene are important factors in transmission of trichomonas infection.

J. G. Dumoulin

208. **The Importance of the Localization of the Trichomonas Vaginalis in the Ureters and in the Female Renal Pelvis in Relapsing Cases.** (Importancia de la localizacion de las tricomonas vaginales en los ureteres y en la pelvis renal femenina por las recidivas de la trichomoniasis.)

By B. BERIC. *Obstet. Ginec. lat-amer.*, **16**, 168–171. June 1958. 3 figs. 19 refs.

After surveying the literature on the localization in the genital tract of the *Trichomonas vaginalis*, the author publishes his own investigations of the urinary tract in a series of 20 patients who had attended his clinic with this infestation, which defied all forms of vaginal therapy. Their ages ranged between 18–27 years. In each case a ureteric catheter was passed after washing out the bladder, and urine withdrawn for examination from the ureters and the renal pelves. By this means the *Trichomonas vaginalis* was found in 8 cases, yet none of these patients complained of any symptoms suggestive of renal inflammation. The distribution of the positive findings was as follows: Ureters—right, 4; left, 6; both sides, 3. Pelves—right, 2; left, 1. The pH of the urine varied between 6·1 and 6·9.

John F. Foulkes

NEW GROWTHS OF THE REPRODUCTIVE ORGANS

209. **The Use of the Phase Contrast Microscope for Urgent Diagnosis in Gynaecological Emergencies.** (L'esame microscopico a contrasto di fase nella diagnosi d'urgenza in ginecologia.)

By G. REMOTTI. *Ann. Ostet. Ginec.*, **79**, 1154. Nov. 1957. 17 figs. 7 refs.

The author has used the phase contrast microscope to study thinly cut frozen sections of recently removed tissues from gynaecological cases. The results are very well illustrated with photomicrographs.

The method is of the greatest value in the study of suspected carcinoma.

Josephine Barnes

210. **Epidermoid Cyst of the Labium Minus.** (Quiste epidermode del labio menor.)

By N. ARENAS and R. A. VOTTA. *Obstet. Ginec. lat.-amer.*, **15**, 425–429. Dec. 1957. 4 figs. 17 refs.

The authors begin their report by commenting on the rarity of cysts of the labium minus and the clitoris, and by stating that their case is the first to be reported in the Argentine, and the only one among 13,928 patients admitted to their department, including 288 patients with vulval lesions.

The patient was a multipara aged 27 years. She had noticed a swelling on the vulva for two years, but its rate of enlargement had rapidly increased during the past ten months. At the time of operation, it measured 12×7×7 cm., was not tense and arose by a broad pedicle from the left labium minus, encroaching on the prepuce of the clitoris. It burst during removal, and contained a yellow greasy substance. It was unilocular, with a smooth lining wall 2 mm. thick, which, histologically, presented Malpighian and basal layers of cells. There were no papillae.

After discussing many possible theories to explain the origin of this cyst, the authors conclude that this was an implantation cyst following trauma, probably sustained during one of the numerous deliveries.

John F. Foulkes

211. **The Treatment of Carcinoma of the Body of the Uterus in the Gynaecological Clinic, Kiel.** (Die Behandlung des Korpuskarzinoms an der Kieler Klinik.)

By E. PHILIPP and K. RUMPHORST. *Geburtsh. u. Frauenheilk.*, **18**, 1393–1398. Dec. 1958. 9 refs.

The authors have analyzed the results of treatment of carcinoma of the corpus uteri from 1948–1952. A total of 147 patients were treated and the overall five-year cure rate was 60·5 per cent. Total hysterectomy and bilateral salpingo-oöphorectomy was performed on 97 occasions, in 48 cases by the abdominal route and in 49 per vaginam. The five-year cure rate for these two operations was 66·7 per cent and 83·7 per cent, respectively. There was no primary mortality associated with vaginal hysterectomy, whereas 5 women died after abdominal hysterectomy (2 of pulmonary embolus, 1 of peripheral circulatory failure, 1 of paralytic ileus and 1 of peritonitis). The poor results of abdominal hysterectomy compared with vaginal hysterectomy can be related to the selection of cases. Cases were considered suitable for vaginal hysterectomy only if vaginal access was possible, if adnexal masses of inflammation could be excluded and if parametrial infiltration, whether neoplastic or inflammatory, was absent. As a consequence the group of patients treated by vaginal hysterectomy was composed of mostly early cases and younger women. Secondary deposits of carcinoma appeared in the vagina in 4 patients after operation, 2 following abdominal hysterectomy and 2 after vaginal hysterectomy. Of the remaining 50 patients, 1 died before treatment could be started, and the others were given radiotherapy. This consisted in the insertion of radium into the uterus, a total of 6,000 mg. hours being given in 2 or 3 divided doses. The five-year cure rate was 32·7 per cent. Patients were treated by radium whose general condition precluded operation or in whom the growth was so advanced that operative removal was not feasible. The results of treatment from 1948–1952 are compared with those of the preceding 15 years. The striking feature is the increased use of vaginal hysterectomy in recent years. The results from this form of treatment have steadily improved, whereas the results from abdominal hysterectomy and radiotherapy have remained virtually the same throughout the twenty years reviewed. The authors consider that, whenever it can be performed, vaginal hysterectomy is superior to abdominal hysterectomy as regards permanent cure.

[It is not stated whether post-operative radiotherapy was used in patients treated primarily by surgery. Neither is it clear whether deep X-irradiation of the pelvis was used as an adjunct to the insertion of radium.]

Peter J. Huntingford

212. **Recurrence of Carcinoma of the Corpus Uteri.** (Über Rezidive bei Korpuskarzinomen.)

By J. SCHRAKNEPPER. *Zbl. Gynäk.*, **81**, 151–155. Jan. 31, 1959. 2 tables. 15 refs.

The author reports on a series of 373 women suffering from carcinoma of the corpus, treated during the 8 years 1948 to 1955. A recurrence was observed in 84 cases.

Amongst 231 women treated surgically, there were 38 recurrences (16 per cent), half of them in the vaginal vault.

Of 142 women treated by radiotherapy, 46 developed recurrence (32 per cent), just over half of them in the vagina or cervix.

All recurrences appeared within 3 years of the primary treatment. Sixty-one of the 84 patients with recurrence died within 5 years, in spite of further treatment.

With the object of reducing the incidence of recurrence, the author suggests that surgery should include removal of a cuff of vagina. If radiotherapy alone is used, he recommends an additional late intra-cervical application of radium.

Bruce Eton

213. **Critical Comments on the Staging of Carcinoma of the Cervix.** (Kritische Bemerkungen zur Stadieneinteilung des Kollumkarzinom.)

By J. FROEWIS and R. ULM. *Zbl. Gynäk.*, **81**, 37–43. Jan. 10, 1959. 5 tables. 9 refs.

A series of 551 cases was investigated by the authors. Of 363 clinical Stage I cancers, 38 were found to be histologically Stage II, and in 31 cases the lymph nodes were involved. Of 179 clinical Stage II cases, 85 were histologically in Stage I, 92 in Stage II and 2 in Stage III, apart from the fact that in 50 cases the lymph nodes were involved.

In view of these findings, the five-year cure rate was assessed in a series of 157 cases between 1950 and May, 1953 in which the lymph nodes were removed routinely. Clinically they were all thought to be Stage I (95 cases)

or Stage II (62 cases). Yet 30 cases (19·12 per cent) had to be placed in Stage III on histological examination. The five-year cure rate for the clinical Stage I cases was 87·37 per cent, but for the histological Stage I, 85·26 per cent. For the clinical Stage II, the cure rate was 58·03 per cent, but for the histological Stage II, 75·0 per cent because the 30 more advanced cases were removed from this stage.

The authors admit that clinical staging is necessary in order to permit comparison between the results of radiotherapy and surgery. A fair comparison, however, of the results of different surgical schools should be based on the histological staging of the specimen removed at operation.

[The term "histological staging" is accepted in this abstract as it is otherwise difficult to convey the author's sense, although the international method of staging was designed as a purely clinical assessment.] *Bruce Eton*

214. **Clinical and Pathologic Significance of Anaplasia (Atypical Hyperplasia) of the Cervix Uteri.**

By D. G. McKay, B. Terjanian, D. Poschyachinda, P. A. Younge and A. T. Hertig. *Obstet. Gynec.*, **13**, 2–21. Jan. 1959. 11 tables. 23 figs. 14 refs.

In the work of the last decade on carcinoma *in situ* it has been recognized that biopsies from the cervix uteri may reveal lesions which do not seem to fulfil all the criteria for carcinoma *in situ* and yet seem to have some of the cellular characteristics of neoplastic tissue. This lesion has been given several names including "anaplasia" and "atypical hyperplasia".

The authors report on 243 cases of anaplasia in 20,029 cervices examined (1·2 per cent, compared with carcinoma *in situ* 1·3 per cent and invasive squamous carcinoma 3·4 per cent).

There is no gross appearance of the cervix which characterizes anaplasia although an erosion is commonly seen. The average age of the group was 35 years, 3 years younger than that of patients with carcinoma *in situ* and 13 years younger than that of patients with invasive carcinoma.

The clinical outcome of 129 patients on whom adequate follow-up data was available showed that the anaplasia disappeared in 20·2 per cent. In 3·8 per cent the lesion progressed to carcinoma *in situ* or invasive carcinoma. In 32·5 per cent anaplasia was associated with co-existent carcinoma *in situ* or invasive carcinoma. Anaplasia persisted in 26·4 per cent of the cases.

Exfoliative cytological examinations of 67 patients with anaplasia alone were positive in 52·3 per cent at some time, suspicious in 14·9 per cent, and negative in 32·8 per cent. *J. G. Dumoulin*

215. **The Ten Year Results of Surgical Treatment of Carcinoma of the Cervix in a Personal Series of Ninety-seven Cases.** (Étude des resultats obtenus, au bout de 10 ans, dans le traitement chirurgical du cancer du col, basée sur une statistique personnelle de 97 cas.)

By J. V. Meigs. *Gynéc. prat.*, **9**, 263–275. 1958. 9 tables. 1 ref.

As this paper is almost wholly concerned with statistics it is not possible to do it justice in an abstract. Those interested are advised to consult the tables in the text which constitute the nucleus of the paper.

All 97 cases had invasive carcinoma of stages I or II and 45 were treated by surgery alone (in one of these the invasive lesion had apparently been entirely removed by biopsy). The remainder were treated by a combination of radiation and surgery.

Of the 45 surgical cases, the one without carcinoma at operation died of an intercurrent disease, but 37 of the remaining 44 are well at the end of 10 years. (80·5 per cent of those with stage I lesions and 100 per cent of those with stage II.) Seven of the 44 showed gland involvement at the time of operation and 42·8 per cent of these survived 10 years. The results of the combined methods of treatment are as follows:

	Cases	*Per cent Survival*
Operation after radiation (radiation failure)	21	52·4
Operation after radiation (no residual carcinoma) ..	17	94·1
Radiation after operation (surgical failures)	7	14·3
Radiation before and after operation (radiation and surgical failure) ..	7	0

The operation practised was that of Wertheim with bilateral lymph node dissection as advocated by Taussig.

The uretero-vaginal fistula rate was 9·3 per cent. Five of those in stage I cases closed spontaneously [there appears to be an error in the printing of this table—the figure "4" as printed is obviously incorrect]. One of the two uretero-vaginal fistulae in the stage II cases also closed spontaneously.

The author admits the fistula rate to be high but feels there is no place in a radical operation for any attempt to save the peri-ureteric tissues.

The causes of death are analyzed. The incidence of a second carcinoma elsewhere in the body is high. The same series has been previously reported at 5 years and 5 per cent of those reported as "cured" at that time have subsequently died.

The author feels that the series is too small to throw any important light on the problem of pre- or post-operative irradiation in the treatment of carcinoma of the cervix but that it does show that the results of surgery alone can be quite satisfactory. *Geoffrey Dixon*

216. **Endometriosis in Abdominal Scar Following Cesarean Section.**

By S. M. Martins. *West. J. Surg. Obstet. Gynec.*, **66**, 340–342. Nov.–Dec. 1958. 6 refs.

A case of this condition is reported in a 29-year-old 3-para. This is the 27th case in the literature and it is

suggested that the condition is very rare as the endometrium is least capable of growth at delivery, and to assure growth small pieces of myometrium must be implanted at the same time. *D. C. A. Bevis*

OPERATIONS

217. **Ovarian Homografts: Survival Within Millipore Filter Chambers in the Monkey.**

By H. CASTELLANOS and S. H. STURGIS. *Obstet. Gynec.*, **12,** 603–609. Dec. 1958. 16 figs. 3 refs.

The survival of homotransplanted tissue embedded in cellulose ester filter that excluded all formed elements of the blood but was porous enough to allow proteins, electrolytes, and other circulating substances in tissue juices to pass through was demonstrated some years ago. Using this technique the authors have reported survival of ovarian tissue transplants in the rat for 3 months or more. Successful results were obtained with ovarian tissue transferred from one species to another—a homologous homograft. Thus, ovarian fragments can survive and function without a direct blood supply.

These experiments were extended to monkeys. An autograft of ovarian tissue was placed in the broad ligament in a Millipore filter before castration in a Maccacus monkey and found to function. In other cases homografts from another monkey of the same species showed functional activity. A heterograft of an ovary from a Mangueby monkey to a Maccacus also functioned successfully. *J. G. Dumoulin*

218. **The Transperitoneal Transvesical Repair of Vesicovaginal Fistula.**

By K. MORGAN. *S. Afr. med. J.*, **33,** 113–116. Feb. 7, 1959. 6 figs.

The author claims that this procedure should be reserved for those cases which have been unsuccessfully repaired by the vaginal approach. It is also an easier approach in cases following hysterectomy. The chief advantages are better exposure, greater freedom of movement for operative procedures, easier excision of the tract and adequate visualization of the ureteric orifices.

Pre-operative investigation and care is discussed and the operation is described in detail. Ureteric catheters are inserted prior to any extensive dissection. Following dissection of the bladder from the vaginal defect, the latter is closed with interrupted sutures. The muscle layer of the bladder is then sutured as is the peritoneum. The extra-peritoneal portion of the dome of the bladder is then incised and a No. 36 Pezzer tube is inserted (this is left *in situ* for 10–14 days). A urethral catheter is also inserted and irrigated with sterile methylene-blue solution to be sure that there is free flow through the Pezzer tube and that there is no vaginal spill. Post-operative care is discussed.

The average stay in hospital is about 3 weeks. The author has performed this operation on 16 occasions where vaginal procedures have failed, or where the fistula was high in the vagina or large. Of these, 15 have been successful in one attempt. *L. J. Abramowitz*

219. **The Pathology of the Cervical Stump After Subtotal Hysterectomy. A Clinical and Statistical Study of 273 Cases with Notes on the Pathological Anatomy.** (La patologia del moncone residue: relievi clinico-statistic su 273 casi con note di anatomia patologica.)

By R. BIANCO. *Ann. Ostet. Ginec.*, **79,** 1131. Nov. 1957. 7 figs. 44 refs.

A series of 273 women who had undergone subtotal hysterectomy have been followed up for periods of two to twelve years with special reference to the fate of the cervical stump.

Abnormal changes were found in 144 cases (52·7 per cent). Of these, 135 showed inflammatory changes in the stump, 2 had recurrent fibroids, 2 had frank carcinoma and a further 2 had proliferation of the epithelium, considered to be pre-cancerous. There were 13 polyps of the cervix and 24 cases of prolapse.

In view of the frequency of pathological changes in the stump and the risk of prolapse it is concluded that subtotal hysterectomy is to be avoided whenever possible, the total operation being preferred. Subtotal hysterectomy should only be performed when there are special difficulties in the performance of total hysterectomy.

Josephine Barnes

220. **The Limits and Indications for Pelvic Exenteration in Advanced Pelvic Cancer.** (Les limites et les indications de l'exentération pelvienne pour la carcinome gynécologique en phase avancée.)

By M. DARGENT. *Ann. Ostet. Ginec.*, **79,** 1244. Dec. 1957. 13 figs.

The indications for pelvic exenteration in advanced pelvic cancer are discussed.

The general condition of the patient, the gynaecological condition and the state of the renal tract are of the greatest importance. Cystoscopy and intravenous pyelography are essential. Radiological and clinical examination of the rectum and sigmoid colon is also important. The main technical points in the performance of these operations are outlined. Post-operative complications which have proved fatal have included sepsis, uraemia, hypokalaemia, pulmonary embolism, mesenteric infarction and cardiac collapse.

Other complications encountered have included subacute intestinal obstruction, acute spasm of the iliac arteries, post-operative vascular accidents, thrombophlebitis, and acute parotitis.

Study of the intravenous pyelogram following anterior and total exenteration has revealed in some cases gradual dilatation of the renal pelvis, in others no change and in some an improvement of the renal excretion after operation.

The main indications for pelvic exenteration are summed up as follows:

(1) In cancerous vesico-vaginal or recto-vaginal fistulae.

(2) In extensive malignant disease or very painful conditions.

(3) In malignant disease invading the ureters.

(4) In cancerous lesions with infection, pyometra or severe repeated haemorrhage.

The surgeon must never forget that his role is to cure these desperate cases sometimes and always to relieve suffering. Pelvic exenteration must be undertaken with much discrimination.

Josephine Barnes

221. **The Choice of Operation for Diversion of Urine Before Pelvic Exenteration for Advanced Genital Carcinoma with Urological Complications.** (Le choix des opérations de déviation urinaire. Temps préalable à l'exentération pelvienne dans les cancers gynécologiques à un stade avancé avec complications urologiques.)

By M. DARGENT, M. MAYER, J. COLON and H. CHAPUIS. *J. Urol. méd. chir.*, **64**, 1–12. 1958. 3 figs. 20 refs.

Seventy per cent of cases of cancer of the uterus, especially cancer of the cervix, die from renal failure. In some of these cases urinary deviation should be practised. Any of the following methods may be useful. Ureteric catheterization, ureteric transplantation, cutaneous ureterostomy, nephrostomy, nephrectomy if one of the kidneys is destroyed, and cystotomy if the urethral orifice is blocked. Cutaneous ureterostomy is worth employing if there is no chance of doing a palliative exenteration, or if a palliative exenteration would damage the anal sphincter.

J. H. Carver

UROLOGY

222. **Urinary Stress Incontinence in Women: A Simple Method for Its Correction.**

By R. LICH, JR., and J. E. MAURER. *J. Urol.*, **81**, 133–134. Jan. 1959. 2 figs. 2 refs.

Little has been added to our knowledge of the cause of stress incontinence since the original articles of Watson and Bonney of 35 years ago. The authors of this paper recommend ribbon gut as a urethral support instead of living fascia. A stiff urethral catheter is first passed, and through a small midline suprapubic incision the proximal urethra is defined and freed as far as possible from the vaginal wall. The patient is then put in the lithotomy position and the anterior vaginal wall incised just distal to the vesical orifice. A Young's prostatic retractor is a useful instrument to define the junction of the bladder and urethra. The urethra is freed from the vaginal wall for about 2 cm. and the ends of the ribbon gut are passed into the retropubic space on either side. They are made to emerge through the rectus muscle and sheath about 2·5 cm. from the middle line. The ends of the gut are securely knotted so that the proximal urethra is given support but not unduly elevated.

J. H. Carver

223. **Experience with the Marshall-Marchetti-Krantz Operation.** (Erfahrungen mit der Operation nach Marshall-Marchetti-Krantz (Urethro-vesicofixation).)

By H. NÖLLE. *Geburtsh. u. Frauenheilk.*, **19**, 135–139. Feb. 1959. 1 table 10 refs.

The technique is described which has been used to perform urethro-vesical fixation in 64 cases of stress incontinence at the City Hospital, Bielefeld. With a Foley catheter in the bladder, a sub-umbilical incision was made to expose the retro-pubic space, and the bladder was freed from the back of the symphysis pubis by blunt dissection. In order to facilitate the insertion of stitches in the para-urethral tissues, the surgeon used his own left hand in the vagina in order to push up and steady the tissues. He found that this made the laying of the stitches and the finding of the correct layer much easier. Thus, he avoided sutures cutting out and sutures perforating the vaginal mucosa, because of being either too superficial or too deep. Once these stitches had been inserted, the left hand was withdrawn from the vagina and after scrubbing-up again, the operation was continued by using the laid stitches (1–3 sutures of chromic catgut on either side) to fix the para-urethral tissues to the posterior surface of the symphysis pubis. The bladder neck was finally anchored to the posterior rectus sheath by 1 or 2 interrupted sutures on either side.

The indications for the operation were stress incontinence in patients with no demonstrable prolapse, or those in whom a vaginal repair had already failed to effect a cure, and in some cases where there was an indication for laparotomy, e.g., fibroids, ovarian cysts and uterine carcinoma.

The complications were few, namely, in 2 patients the wound became infected, there were 5 cases of osteitis pubis, in 2 patients there was post-operative haematuria (this low figure is attributed by the author to the bimanual technique used for inserting the stitches), there were 4 cases of thrombosis, and one-third of the patients required an indwelling catheter for periods up to 1 week.

Forty-seven patients were followed up for periods of 1½–5 years. In 36 the results were described as very good and in a further 7 patients as good (incontinence only under severe stress). Four patients experienced difficulty in initiating micturition. In only 1 case had there been no relief of the stress incontinence. Three patients subsequently became pregnant. Two were delivered vaginally and the other by Caesarean section for obstetric reasons, and in none of these patients had there been any recurrence of the stress incontinence.

Peter J. Huntingford

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